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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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75-2311. Olszewski, W. A.; Pillay, K. K. S.; Glomski, C. A.; Brody, H. (Buffalo Gen. Hosp., Buffalo, NY). **Mercury in the human brain.** *Acta Neurol. Scand.* 50(5): 581-588; 1974. (18 references)

Environmental pollution by mercury is discussed and two cases of elevated level of Hg in human brain attributed to pollution reported. The prevalence of Hg in the environment is increasing. Excessive Hg levels are found in fish and can be released to the environment through the burning of fossil fuel. In 1968, a commission in Stockholm established the upper limit of safe concentration in the brain to be 1.0 ppm, one-tenth of the concentration was presumed to be associated with irreversible injury or death. Fatalities following acute exposure to organic mercurials have been associated with Hg concentrations in the brain as low as 4.0 and 4.5 ppm. Fresh brain tissue from 17 randomly selected autopsies was analyzed for Hg using neutron activation analysis. Two of the patients had levels in excess of 1.0 ppm with no exceptional Hg exposure. Concentrations of Hg in the cerebellum, geniculate bodies, pons, calcarine cortex, and corpus striatum were 4-10 times as high as those observed in other subjects. The increase of Hg deposition was more marked in the thalamus, the frontal polar cortex, and the motor cortex where levels of 15-20 fold were obtained. Both subjects had a history of malignancy without brain metastases, as did about 50% of the other subjects.

75-2312. Zdarek, J. (Entomol. Inst., Czechoslovakian Acad. Sci., Prague, Czechoslovakia). **Latky ovlivnujici chovani hmyzu a moznosti jejich vyuziti. [Substances affecting insect behavior and possibilities of their application.]** *Agrochemia* 14(3): 245-249; 1974. (14 references) (Czech)

Insects have a highly developed sense of smell, and produce and use many chemicals, mostly terpenol derivatives, in order to control their instinctive behavior. Biologically active pheromones of aggregative, dispersive, and sexual types have properties which make them potential non-toxic insecticides. The most realistic of these is the sexual pheromone which has been identified and extracted from several hundred insects and is used commercially in the U.S. Common methods of application are either as a bait to capture male species or as an air saturation agent which deprives the insects of the capability to behave according to their own pheromones. The first method has been found effective in places with low-level contamination by pests, while the second method is more suitable for highly contaminated areas. Pheromones are obtained from insect bodies by extraction or volatilization. A table of the chemical composition of 16 common pheromones and of the roles they play in behavior of various insects is provided. Pheromones were first discovered in Czechoslovakia, but no significant progress in their application and identification has taken place in that country.

75-2313. Batora, V. (Res. Inst. Agrochem. Technol., Bratislava, Czechoslovakia). **Chemicka ochrna rastlin, nase potraviny a krmoviny. [Chemical protection of plants and human and animal food.]** *Agrochemia* 15(4): 109-110; 1975. (Slovak)

Daily consumption of pesticide residues with food is unavoidable because chemcial protection of plants is an important part of contemporary agricultural practice. Chronic effects of pesticide residues are difficult to determine. It is therefore necessary to establish a system of coexistence between people and pesticides. Pesticide residue levels in food will be most successfully decreased by education of farm and industry personnel, by continuous regulation and control of all chemicals used for protection of plants, and by an enforcement of safety and quality control measures in manufacturing, packaging, and transportation.

75-2314. Varkonda, S.; Kubala, V. (Res. Inst. Agrochem. Technol., Bratislava, Czechoslovakia). **Vyskum a vyvoj novych pesticidov. [Investigation and development of new pesticides.]** *Agrochemia* 15(4): 110-114; 1975. (Slovak)

Concepts and procedures for investigation and development of new pesticides are reviewed. The most economical approach is based on empirical methods of screening of promising substances, using biological effectiveness tests and preliminary toxicological tests. Selection of substances can be random, regulated, or based on scientific research; the yield is normally less than 5%. Most screening is performed in vitro and under hot-house conditions, using test objects and methods which most fully represent the particular pest organisms, i.e., plants, fungi, and insects, which are sensitive to very small doses. Screened substances are then subjected to field tests in small-lot sizes, accompanied by simultaneous subchronic toxicological tests. At this stage one also has to consider the methods of production. Subsequently, the pesticide is perfected during large-scale field tests under realistic conditions. The study of residues left by the pesticide in the environment as well as chronic toxicology tests are performed during this stage. Finally, the new pesticide has to be adequately protected by patenting on an international scale. Normally, the development process takes 5-8 years.

75-2315. Smith, P.; Smith, L. (Tin Res. Inst., Greenford, Middlesex, England). **Organotin compounds and applications.** *Chem. Brit.* 11(6): 208-212, 226; 1975. (51 references)

Triphenyltin hydroxide and triphenyltin acetate are both used in a number of agricultural formulations for the control of a variety of fungal growths, particularly potato blight. A sensitive fluorimetric technique has been developed for the determination of triphenyltin residues on treated potato samples, and this method has indicated the apparent safety of these formulations. Trichlorohexyltin hydroxide is effective for controlling fruit tree red spider mite on apples and pears. Tricyclohexyl- and triphenyltin derivatives leave no long-lasting harmful residues in the soil and no species has as yet developed immunity. Trialkyltin compounds, particularly the trimethyltins, are ef-

fective in insect control, although their practical use is often restricted by their toxicity to mammals and plants. It is felt that certain triphenyltin derivatives may be useful as chemosterilants in the field of insect sterilization. Environmentally, organotin compounds have an advantage over alternative organometallic derivatives in that the inorganic tin species formed upon degradation are nontoxic. The triphenyl and tricyclohexyl-tins used in agriculture are rapidly broken down by the combined action of light and microoorganisms.

75-2316. Suffet, I. H.; Friant, S.; Marcinkiewicz, C.; McGuire, M. J.; Wong, D. T. L. (Environ. Eng. Sci., Drexel Univ., Philadelphia, PA 19104). **Organics.** *J. Water Pollut. Control Fed.* 47(6): 1169-1241; 1975. (701 references)

Studies on organic pesticides are reviewed and include chlorinated hydrocarbons, polychlorinated biphenyls, naphthalenes, carbamates, and urea. Information is presented on the analysis of pesticides; confirmation of pesticide identity and structure; fate and movement of pesticides in the environment; chemistry of polychlorinated biphenyls and chlorophenyls; chemistry and biochemistry of organophosphorus pesticides; toxicity, biological effects, and fate of organophosphorus residues; cleanup of herbicides and carbamates; toxic effects of chlorinated hydrocarbon biocides in aquatic organisms; residues of chlorinated hydrocarbons in aquatic related organisms; residues of chlorinated hydrocarbons in soils and sediments; photolysis studies of chlorinated hydrocarbons; toxic effects of polychlorinated biphenyls on aquatic related organisms; the environmental impact of pesticides; the toxic effects of herbicides to aquatic related organisms; adsorption of herbicides; and photolysis of herbicides.

75-2317. Anonymous. **Growth regulator cuts hazards.** *Pest. Contr.* 43(7): 20,22,37; 1975.

The characteristics are described of the growth regulator Altosid SR-10 which is registered by the Environmental Protection Agency for use against mosquitoes. Altosid is specific to the mosquitoes and appears to pose less of a hazard to applicators, fish, birds, and most other wildlife than other moquito control pesticides. Altosid SR-10 prevents adult mosquitoes from emerging from the pupal stage. It is applied during the larval stages. The larvae mature normally and molt to the pupal stage, at which point Altosid and other insect growth regulators (IGR) prevent further development into viable adults. There is no mammalian toxicity for Altosid; it is impossible to kill a rat with a single dose. The acute oral LD50 is more than 34,500 mg/kg. The EPA set up an exemption for Altosid from the tolerance requirement in mosquito control use. This means it can be used without chemical residue restrictions in drinking water, meat and fat of cattle, goats, hogs, horses, sheep, and poultry, rice, pasture grasses, or pasture legumes. Technical Altosid lasts less than 24 hr when applied to water in direct sunlight. The residual properties of Altosid SR-10 are excellent for control of floodwater mosquitoes such as *Aedes nigromaculis, A. melanimon,* and *A. taeniorhynchus* found in irrigated pastures, coastal tidal marsh pools, and rice fields.

75-2318. Khambata, S. R. (Rallis India, Ltd., Bombay, India). **In perspective: environmental hazards for pesticides.** *Pesticides* 8(12): 59-68; 1974. (38 references)

The health effects of pesticides and the benefits to mankind when used properly are discussed. DDT and other organochlorine insecticides are persistent for a relatively long period in soil, but this is a desirable attribute in the control of pests like termites. The annual loss in potential world food production due to fungus disease is nearly 12%, 500 million tons of food worth 25,000 million dollars. Without the use of fungicides the losses would be much higher. The toxicity of most herbicides to mammals and birds is so low that no adverse effects on wildlife have been observed. It has not been shown that the accumulation of DDT in humans or animals ever reaches harmful levels. Suggestions that organochlorine compounds produce cancer and/or genetic changes in many have been discounted by reputable medical toxicologists. The present evidence from the United Kingdom is that pesticides pose no threat to those who handle them properly. The United States Public Health Service considers the benefits of DDT to man for its use in the control of malaria outweigh any potential hazard. More than 1000 million people have been freed from the risk of malaria in the past 25 years, mostly due to DDT. Even today 329 million people are being protected from malaria through DDT spraying operations for malaria control. The only confirmed cases of injury from DDT have been the result of massive accidental or suicidal swallowing of DDT.

75-2319. Southwood, T. R. E.(Dep. Zool. Appl. Entomol., Imperial Coll. Sci. Technol., London, England). **Environmental problems–today and tomorrow.** *Pharm. J.* 214(5822): 525-526; 1975. (6 references)

The ever increasing population of the earth requires ever increasing amounts of energy. This energy is of two types: first, food, the fuel for the body; second, support energy, the fuel for society's machines, including the fuel necessary to provide the energy for the production of chemicals such as pharmaceuticals and fertilizers, pesticides, and others. It is clear that the agricultural output needs to be increased to keep pace with population growth. Most ways of doing this, such as using increased amounts of fertilizer, increased amounts of pesticides, and increased mechanization, greatly increase the amount of support energy/unit of energy output. Much of the energy used in meeting the increased food requirements comes from non-renewable resources. An additional problem is the creation of soil degradation by overproduction or pollution by pesticides and fertilizers. Pesticides may spread through environmental pathways, affect wildlife, and ac-

cumulate in people so as to pose a health hazard. Overuse of pesticides may enable the pest a farmer is fighting to develop resistance to that chemical, forcing the synthesis of new and probably more costly substitutes. DDT is a classic example of overuse.

75-2320. Margham, P. (Dep. Biol., Liverpool Polytech., Liverpool, England). **Insecticide resistance, a problem in applied biology.** *Sci. Progr. (London)* 62(246): 333-351; 1975. (118 references)

Insecticide resistance is a classic example of microevolution, in which toxic chemicals act as strong selective forces to genes responsible for increased tolerance while eliminating genes controlling susceptibility. The chief way of overcoming the problem of resistance has been to switch from one type of compound to another. However, resistance to each of the successive chemicals seems likely to develop also. To understand the mechanisms by which insects tolerate poisonous chemicals, the main ways in which insecticides work must be understood. Modes of resistance include altered behavior, differential penetration rates, storage of toxic materials, and insecticide metabolism. These individual resistance mechanisms often interact within a single species to give a compound system. Because the resistance mechanisms to deal with foreign chemicals are often so specific in insects, alternative forms of insecticides (analogues) have been developed in the hope that the new form would not be metabolized so easily.

75-2321. Cole, H. A. (Min. Agric., Fisheries and Food, Fisheries Lab., Lowestoft, England). **Summing up and consideration of future research needs.** *Proc. R. Soc. London B* 189(1096): 479-483; 1975.

Most questions regarding organic pollutants and their behavior in the sea cannot at present be satisfactorily answered. Only in the areas of DDT and dieldrin and the PCBs can any definitive answers be obtained. The main burden of preventing damage to the marine environment and its living resources must rest with the responsible government departments. However, due to volumes of work, scientists in the departmental laboratories must rely on their counterparts in the marine stations and the laboratories to provide the background evidence needed regarding the behavior of pollutants and their effects. Thus, a good working partnership should be developed between these two groups of scientists. Also included in this cooperating group must be the industrial scientist who has access to practical experience lacked by the other two. The scientists working for specific industries cannot be expected to look far beyond the immediate requirements of their particular companies. Thus a large part of the job must be carried by the universities and marine stations. The target should be to provide an adequate basis for realistic assessment of the likely consequences of any proposed method or place of disposal of any industrial or other water, ultimately in any part of the world ocean.

75-2322. Manzano Perez, J. (Dep. Invest. Cientifica, Inst. Mexicano del Seguro Social, Mexico). **Ecologia y salud. [Ecology and health.]** *Salud Pub. Mexico* 16(5): 765-770; 1974. (6 references) (Spanish)

A description is presented of the self-regulatory mechanisms which maintain a balance between the most important characteristics of ecosystems. Elements, introduced by man, which the global ecosystem cannot properly absorb are analyzed. For example, such problems as overpopulation, deterioration of natural resources, and rapid accumulation of pollutants (e.g., chlorinated hydrocarbon pesticides), if present growth rates continue, will seriously curtail the quality of human life. A population stabilization program and the development of a less destructive technology, as well as a more realistic distribution of needed goods are suggested. This would entail a different world lifestyle which should create imaginative responses to the problems of an endangered environment and the future well-being of mankind.

75-2323. Chapman, T. (Author address not given). **El futuro de los plaguicidas. [The future of pesticides.]** *Agric. Am.* 22(12): 16-18,53; 1973. (1 reference) (Spanish)

Agricultural losses sustained in the U.S. as a consequence of insects, weeds, plant diseases, and nematodes total $15 billion annually. Also, 65% of the U.S. cotton crop in 1968 was treated with insecticides and 75-80% with herbicides; 50% of the corn crop was treated with insecticides and 75% with weed-killers. Of the 4500 insect species of economic importance, only 2.5% can be controlled by "natural" means. Biological control, "third generation" insecticides, and the use of lures are being developed, but will be inadequate as replacements for present techniques in light of increased demands for food production. Changes in the present pesticide policy will be shifts in emphasis rather than in direction.

75-2324. Ministros de Salud de las Americas. (Santiago, Chile). **Saneamiento Ambiental. [Environmental sanitation.]** *Bol. Of. Sanit. Panam.* 76(1): 72-76; 1974. (Spanish)

Figures are given on water and sewage service development in Latin America (including the Caribbean) together with recommendations for legislative, administrative, and educational programs in this area. Similar but less detailed treatment is given the following subjects: collection and disposal of solid waste, contamination of the environment (water, air, soil), and control of noise and other sources of human tension. Pesticides receive passing mention as agents of soil pollution, and it is recommended that environmental protection programs should be integrated, since pollution of one element of the environment tends to affect the others

75-2325. Bauza, C. A. (Prof. Adjunto Honorario Pediatr., Fac. Med., Univ. de la Republica, Montevideo, Uruguay). **Residuos de plaguicidas organoclorados en leche de madres de Montevideo. [Organochlorine pesticide residues in mothers' milk in Montevideo.]** *Arch. Pediatr. Uruguay* 46(1): 31-42; 1975. (25 references) (Spanish)

Significant levels of organochlorine pesticide contamination have been indicated by national research on residues in 10 mothers of low socioeconomic levels in Montevideo, Uruguay. Results revealed total DDT (0.230 ppm/whole milk), β-hexachlorocyclohexane (β-BHC) (0.057 ppm), heptachlor epoxide (0.002 ppm), and dieldrin (0.032 ppm). Endrin and polychlorinated biphenyls were not detected. FAO/WHO practical residue limits for fresh cow's milk were exceeded 4.6 times by DDT, 6.4 times by dieldrin, and 2.5 times by heptachlor epoxide. No β-BHC residues are permitted. A 5 kg infant ingesting 800 ml mother's milk would receive 7.3 times the "admissible daily ingestion" allowable for DDT, 51.2 times that allowed of dieldrin, and 0.6 times recommended heptachlor epoxide levels, as well as β-BHC, for which no allowance exists. A study of a representative number of mothers, the identification of probable sources of ingestion, and national norms for their use are recommended.

75-2326. Iwata, Y.; Dusch, M. E.; Westlake, W. E.; Gunther, F. A. (Citrus Res. Cent., Dep. Entomol., Univ. California, Riverside, CA 92502). **Behavior of five organophosphorus pesticides in dust derived from several soil types.** *Bull. Environ. Contam. Toxicol.* 14(1): 49-56; 1975. (8 references)

Laboratory experiments were conducted to observe the behavior of 500 ppm of azinphosmethyl, dioxathion, ethion, parathion, and phenthoate in soil dusts obtained from a wide variety of soil types. The spiked dusts were incubated at 30°C with constant overhead fluorescent illumination. The samples were extracted with benzene-acetone and analyzed on a gas chromatograph with a flame photometric detector. Of the five pesticides, parathion was the least persistent, although it could be quite persistent under somewhat dry conditions. Phenthoate was more persistent, but like parathion its degradation was largely dependent on microbial action. Soil type had a pronounced effect on the degradation of azinphosmethyl, which showed a half life ranging from 10 days in two clays and a silt loam to 80 days in a sandy loam and a loam; both chemical and biological degradation were suggested. Dioxathion also showed a moderate to high persistence, the residues disappearing most rapidly from the drier, fine sandy loam-derived dust. Of the five pesticides, ethion was the most persistent in soil dust. In all dusts, regardless of soil type, the predicted half-life of ethion was 420 days. These results may serve as a guide for future field studies.

75-2327. Byast, T. H.; Hance, R. J. (Agric. Res. Council Week Res. Org., Yarnton, Oxford, England). **Degradation of 2,4,5-T by South Vietnamese soils incubated in the laboratory.** *Bull. Environ. Contam. Toxicol.* 14(1): 71-76; 1975. (8 references)

The ability of four South Vietnamese soils to degrade 2,4,5-T was studied. Two of the soils were acidic grey podzolic soils from an agricultural area near Dong-Hiep village; the other two were saline undifferentiated alluvial soils from mangrove swamps. The soils were air dried, sieved, and treated with 1.0 ml of an acetone solution of ^{14}C-carboxyl labeled 2,4,5-T butyl ester; the herbicide concentration in the samples was 1-15 ppm. With all of the soils at 15 ppm 2,4,5-T, the maximum rate of labeled CO_2 evolution occurred after an initial lag period; with one exception, this lag was not observed at 1 ppm herbicide. Following the 1 ppm treatment, 64-69% of the applied ^{14}C had evolved as CO_2 within 49 days, while at 15 ppm, 74-96% had been evolved by day 168. Less than 4% of the quantity applied at 1 ppm could be extracted from the soils on the forty-ninth day, and 1-16% of the 15 ppm application was extractable by day 168. The results indicate that the soils studied are able to degrade 2,4,5-T present in levels at least as high as 15 ppm which corresponds to about twice the rate of military applications in Vietnam.

75-2328. Canonne, P.; Mamarbachi, G. (Dep. Chim. CENTREAU, Univ. Laval, Quebec, Canada). **Residus des insecticides organochlores dans les sediments du haut estuaire du Fleuve St-Laurent. [Organochlorine insecticide residues in sediments of the upper estuary of the St. Lawrence River.]** *Bull. Environ. Contam. Toxicol.* 14(1): 83-87; 1975. (8 references)

The distribution and levels of organochlorine insecticide residues in sediments of the upper estuary of the St. Lawrence River were studied. Sediment samples taken in June and July of 1973 were extracted with acetone and *n*-hexane, cleaned up by column chromatography on activated florisil, and analyzed by electron capture gas chromatography. DDT and its metabolites were detected in appreciable quantities (up to 34.4 ppb) at nearly all sampling sites, while α-BHC, γ-BHC, heptachlor, and dieldrin were found only in a few samples and in very low concentrations. None of the samples contained detectable amounts of β-BHC, aldrin, or heptachlor epoxide. Differences in the organochlorine residue levels at various locations are presumably due to a greater rate of sedimentation in the absence of current and also to local agriculture and the sediment texture.

75-2329. Ware, G. W.; Cahill, W. P.; Estesen, B. J. (Dep. Entomol., Univ. Arizona, Tucson, AZ). **Volatization of DDT and related materials from dry and irrigated soils.** *Bull. Environ. Contam. Toxicol.* 14(1): 88-97; 1975. (8 references)

The vaporization of DDT and related materials from miniature dry and irrigated soil units was measured at different seasons of the year following topical application or uniform mixture into the soil. *p,p'*-DDT, *o,p'*-DDT, *p,p'*-DDD (TDE), and *p,p'*-DDE were applied to the ex-

perimental soil units at a rate of 2.0 lb/acre or were incorporated into the soils at 10 ppm. The studies were carried out between August and October 1969, between February and May 1970, and between June and November 1970. Soil analyses were made approximately biweekly using electron capture gas chromatography. With the exception of DDE, the pesticides escaped from the soil surfaces more readily under warm-dry conditions than under cool-moist conditions. *p,p'*-DDT vaporized and was converted to DDT more readily on dry soil than on wet soil and was converted to DDE in or on wet and dry soils. *o,p'*-DDT vaporized more readily from dry than wet soils, was converted to DDT at a greater rate on, but not in, dry rather than wet soil, left no DDT residues, and was vaporized at a greater rate than *p,p'*-DDT under all conditions. *p,p'*-DDE vaporized at a greater rate from wet than from dry soils. Volatilization of topical applications was in the order *o,p'*-DDT > DDD > *p,p'*-DDT > DDE from dry soil and *o,p'*-DDT > DDE > DDD > *p,p'*-DDT from wet soil.

75-2330. Pree, D. J.; Stewart, D. K. R. (Canada Dep. Agric., Res. Station, Kentville, Nova Scotia, Canada). **Persistence in water of formulations of the insect developmental inhibitor ZR515.** *Bull. Environ. Contam. Toxicol.* 14(1): 117-121; 1975. (6 references)

The stability of two formulations of the insect developmental inhibitor ZR515 in fresh and salt water was tested in the laboratory under varying conditions of temperature and pH. Fresh water (pH 5.5) was obtained from a nontidal area of a stream in Kentville, Nova Scotia, and salt water (pH 7.4) was obtained during incoming tides on the Bay of Fundy. ZR515 (*trans* isomer) in 4-lb A.I./gal E.C. and 10% flowable liquid micro encapsulated formulations were dissolved in the water samples to final concentrations of about 1000 ppm. The solutions were maintained in 4.5° or 20°C in the absence of sunlight. ZR515 E.C. persisted for 134 days at 4.5°C in both fresh and salt water, and for 49 days at 20°C in both fresh and salt water. ZR515 E.C. was more persistent in salt water than in fresh water. The flowable liquid formulation was more persistent than the E.C. formulation; its persistence was greater at 4.5°C than at 20°C, and its degradation proceeded faster in fresh water than in salt water.

75-2331. Smith, A. E.; Grover, R.; Emmond, G. S.; Korven, H. C. (Res. Stn., Agric. Canada, Regina, Saskatchewan, Canada). **Persistence and movement of atrazine, bromacil, monuron, and simazine in intermittently-filled irrigation ditches.** *Can. J. Plant. Sci.* 55(3): 809-816; 1975. (12 references)

Atrazine (22.4 kg/ha), bromacil (15.2 kg/ha), monuron (35.8 kg/ha), and simazine (22.4 kg/ha) were applied to specially prepared irrigation ditches in the fall of 1970. Soil samples from ditch sides, ditch bottoms, and basins irrigated with water were taken during 1971, 1972, and 1973 seasons. Water samples were also taken during these years. The soil and water samples were analyzed chemically to determine the herbicide residues remaining in the ditches and basins, their movement in the soil profile, and the amount of herbicides carried in the flowing water over the 3-yr period. The order of persistence for the four herbicides was simazine ⟩ atrazine ⟩ monuron ⟩ bromacil. Atrazine, bromacil, and monuron residues were distributed uniformly throughout the 90-cm soil depth by the third growing season. The greater part of simazine residues was, however, still present in the top 7.5-cm soil layer. In irrigation waters, the highest herbicide concentrations were in the initial ponding in the spring of 1971, decreasing by a factor of two- to fivefold in the second filling in 1971. The relative amounts of each herbicide in the first two water samplings were inversely proportional to their respective water solubilities. (Author abstract by permission)

75-2332. Townsend, L. R.; Specht, H. B. (Res. Stn., Agric. Canada, Kentville, Nova Scotia, Canada). **Organophosphorus and organochlorine pesticide residues in soil and uptake by tobacco plants.** *Can. J. Plant Sci.* 55(3): 835-842; 1975. (13 references)

Studies were conducted in 1972 with four organophosphorus insecticides, chlorpyrifos (Dursban), leptophos (Phosvel), methidathion (Supracide), and N-2596 and in 1973 with chlorpyrifos, leptophos, and methidathion and one organochlorine, heptachlor, to determine their residues in soils and tobacco (*Nicotiana tobacum* L.) plants. In 1972, all organophosphorus pesticides were detected in the soil 3 mo after application, but none was detected in cured tobacco leaves. In 1973, ca. 68% of the leptophos applied in June was found in soil in September, whereas only 20% of the chlorpyrifos and 2% of the methidathion was detected. Heptachlor was persistent in the soil and its conversion product, heptachlor epoxide, was detected in the soil in September but not in June. Gamma chlordane, an impurity in technical heptachlor, was also detected in the soil. In non-cured tobacco, chlorpyrifos and leptophos were detected in sand leaves but not in mid or top leaves. Methidathion was not found. Heptachlor, heptachlor epoxide, and γ-chlordane were found in sand, mid and top leaves. (Author abstract by permission)

75-2333. Berigari, M. S. (North Carolina State Univ., Raleigh, NC). **Adsorption of propham and chlorpropham by expansive-type layer silicates.** *Diss. Abstr. Int.* 34(9): 4154B-4155B; 1974.

The adsorption of propham and chlorpropham by homoionic smectites was studied using X-ray diffraction, adsorption isotherms, kinetics, and IR adsorption techniques. Definitive evidence for interlayer adsorption of both molecules by homoionic smectites saturated with Cs, Ca, or Al ions was obtained from X-ray diffraction data of the clay-organic complexes. Maximum interlayer adsorption of propham or chlorpropham by low-charged or high-charged smectites was limited to a monomolecular

layer. Adsorption by two vermiculites also seemed to occur in the interlayer space though the evidence was not incontrovertible. In general, S-type adsorption isotherms were obtained for propham retention from aqueous suspensions by several Ca-saturated smectites and by one low-charged smectite saturated homoionically with Al, Ca, Na, or H ion, indicating vertical orientation of the organic molecule relative to the surface of the clay adsorbent. The extent of propham adsorption from continuously saturated aqueous solutions by a low-charged smectite followed the order of the calculated surface area available for adsorption (area covered by weakly bound water). The adsorption of the herbicide molecules by smectites was physical in nature since both molecules were recovered intact through direct displacement by water or more efficiently by ethanol. This also agrees with the adsorption isotherms and related data. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 74-5466.)

75-2334. Fickle, J. S. (Univ. Illinois, Urbana, IL). **Environmental factors affecting the movement and persistence of chloramben in soils.** *Diss. Abstr. Int.* 34(9): 4160B; 1974.

Chloramben persistence, movement, and distribution between soluble and insoluble fractions in soil as affected by irradiation, soil moisture, incubation, and leaching were investigated. Chloramben was adsorbed in high percentages by charcoal and anion exchange resin but only to a small degree by two soils with high organic matter contents. Adsorption by Cullo silt loam was increased by decreasing the pH of the water-soluble mixture in adsorption isotherms. Cullo silt loam adjusted to field capacity before drying at 26°C, 90°C, or by a sunlamp at 32°C retained 40% of applied chloramben against water extraction. Chloramben recovered by water extraction was unaltered and decreased velvetleaf radicle elongation. Chloramben recovery by water extraction of Cullo silt loam incubated at 65% field capacity decreased 65% in 26 days. Recovery of ^{14}C by combustion increased to 56% during this time period. Photodecomposition of chloramben on the surface of field capacity soil decreased phototoxicity to oats in as little as 7.5 hr of irradiation by sunlight. Two slower moving compounds resulting from irradiation of aqueous chloramben were detected (paper chromatography). Decarboxylation of chloramben in incubated soil results in small losses of label over 30 days. Chloramben movement on soil-covered thin-layer plates was related to soil texture and less so to organic matter content. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 74-5566).

75-2335. Stoller, E. W.; Wax, L. M.; Haderlie, L. C.; Slife, F. W. (Agric. Res. Serv., Illinois Agric. Exp. Stn., Urbana, IL 61801). **Bentazon leaching in four Illinois soils.** *J. Agric. Food Chem.* 23(4): 682-684; 1975. (7 references)

Bentazon (3-iso propyl - 1*H* - 2,1,3 - benzo thiadiazin - (4)3*H*-one 2,2-dioxide), a postemergence herbicide, was applied at 3.36 kg/ha to four soils in lysimeters where soybeans were growing in 1972 and 1973. Early season, mid-season, and no supplemental irrigation treatments were applied. Leachates were analyzed for bentazon. Bentazon leached through the soil in the initial leachate. No bentazon was detected in the leachates 60 days after application, regardless of when the irrigation was applied. Less than 2% of the applied bentazon was leached through the soils. (Author abstract reprinted by permission of the American Chemical Society)

75-2336. Aharonson, N.; Kafkafi, U. (Pestic. Chem. and Residue Res. Lab., Agric. Res. Organization, The Volcani Cent., Bet Dagan, Israel). **Adsorption, mobility, and persistence of thiabendazole and methyl 2-benzimidazole carbamate in soils.** *J. Agric. Food Chem.* 23(4): 720-724; 1975. (8 references)

Adsorption of thiabendazole (TBZ) and 2-benzimidazolecarbamic acid methyl ester (BMC) to three soils was studied. With increasing acidity of the soil suspensions an increase in the adsorption of these fungicides to the soil occurred. Results indicated ionization of benzimidazole fungicides at lower pH values, and adsorption of these ionized molecules on the soil. Thiabendazole was adsorbed to the soil in much larger quantities than BMC, and therefore at equilibrium, TBZ was detected in the free soil solution in much smaller concentrations. The mobility of TBZ in the soil was also much smaller than that of BMC. The persistence of these fungicides in soil samples, incubated at 25° in small glass vials, was also examined. Nine months after adsorption of these fungicides to the soil, 85-95% of the applied TBZ and 65-75% of the applied BMC were recovered from air dried soils. However, in moist soil after 9 months of incubation only 75-90% of the applied TBZ and 20-30% of the applied BMC were recovered. (Author abstract reprinted by permission of the American Chemical Society)

75-2337. Newsome, W. H.; Shields, J. B.; Villeneuve, D. C. (Bureau Chem. Safety, Health and Welfare Canada, Tunney's Pasture, Ottawa, Ontario, Canada). **Residues of maneb, ethylenethiuram monosulfide, ethylenethiourea, and ethylenediamine on beans and tomatoes field treated with maneb.** *J. Agric. Food Chem.* 23(4): 756-758; 1975. (10 references)

Maneb, ethylenethiourea (ETU), ethylenethiuram monosulfide (ETM), and ethylenediamine (EDA) were measured on crops of beans and tomatoes at 0, 1, 2, 3, 6, 9, and 14 days after treatment with maneb. The levels of all residues declined with time, beans containing more of each compound than tomatoes. After 14 days beans contained the following amounts (ppm) of compound: maneb, 13; ETU, 0.11; ETM, 0.25; EDA, 0.09. The corresponding values for tomatoes were: maneb, 10; ETU, 0.07; ETM, 0.03; EDA, 0.05. (Author abstract reprinted by permission of the American Chemical Society)

75-2338. MacNeil, J. D.; Hikichi, M.; Banham, F. L. (Res. Stn., Agric. Canada, Summerland, British Columbia, Canada). **Persistence of dimethoate and dimethoxon on cherries.** *J. Agric. Food Chem.* 23(4): 758-760; 1975. (9 references)

Two sprays of dimethoate, 10 fluid oz per 100 gal, applied 28 and 14 days prior to harvest on sweet and sour cherry trees, resulted in residues of less than 2.0 ppm of combined dimethoate and dimethoxon at harvest. The recommended use pattern of dimethoate for control of black and western cherry fruit flies in British Columbia should not result in residues at harvest exceeding tolerance levels. (Author abstract reprinted by permission of the American Chemical Society)

75-2339. Kanazawa, J.; Isensee, A. R.; Kearney, P. C. (Agric. Environ. Quality Inst., Beltsville, MD 20705). **Distribution of carbaryl and 3,5-xylyl methylcarbamate in an aquatic model ecosystem.** *J. Agric. Food Chem.* 23(4): 760-763; 1975. (14 references)

The distribution and metabolism of ^{14}C-1-naphthyl-labeled methylcarbamate (carbaryl) and ^{14}C-*N*-methyl-labeled 3,5-xylyl methylcarbamate (XMC) were studied in an aquatic model ecosystem containing 10 kg of Matapeake soil, 80 l. of water, and catfish, crayfish, daphnids, snail, algae, and duckweed. Maximum carbaryl concentration (based on total radioactivity) in water was 16 ppb after 7 days, and decreased to 9.5 ppb after 22 days. XMC increased gradually to 35.8 ppb after 34 days. Bioaccumulation ratios were relatively large (2000-4000) for algae and duckweed, but those for snails, catfish, and crayfish were low (100-500). Soil was the major repository for ^{14}C in these microecosystems; the biomass contained between 0.11 and 1.59% of the ^{14}C. Forty-five percent of residual ^{14}C from carbaryl and 38% residual ^{14}C from XMC could not be extracted from soils and appeared to be bound. Bound insecticide residues in soil were nontoxic to daphnids. Only α-naphthol, carbaryl, and XMC were identified in soils. (Author abstract reprinted by permission of the American Chemical Society)

75-2340. Spear, R. C.; Popendorf, W. J.; Leffingwell, J. T.; Jenkins, D. (Dep. Biomed. and Environ. Health Sci. Sch. Public Health, Univ. California, Berkeley, CA 94720). **Parathion residues on citrus foliage. Decay and composition as related to worker hazard.** *J. Agric. Food Chem.* 23(4): 808-810; 1975. (15 references)

The decay of ethylparathion on citrus foliage was followed for 16 days post-application in 32 groves in central California. Paraoxon comprised a significant fraction of the foliar residue in all groves. In 31 fields paraoxon decayed more slowly than parathion. The combined residues of parathion and paraoxon degrade such that the hazard to workers decreases with time. (Author abstract reprinted by permission of the American Chemical Society)

75-2341. Wenzel, K.; Dedek, W. (Forschungsstelle Chem. Toxikol., Akad. Wissenschaften DDR, Leipzig, DDR). **A simple method for the evaluation of the translocation behavior of agrochemicals in soil.** *J. Chromatogr.* 109(2): 443; 1975. (1 reference)

A simple method for analyzing the translocation behavior of agrochemicals in soil is described. The method is based on the compound's translocation in a soil thin-layer chromatographic layer followed by simple transfer to a silica gel plate and spraying with an appropriate color reagent. When 25 g of a compound was applied to the plate carrying the soil, about 30% was transferred to the silica gel plate, as indicated by a radiolabeling procedure. The method was tested using various organophosphorus insecticides, including trichlorfon and dimethoate. Compounds which are difficult to label with radioisotopes and mixtures of labeled and unlabeled compounds are suitable for study using this method.

75-2342. Dhaliwal, G. S. (Dep. Proc. Agric. Struct., Punjab Agric. Univ. Ludhiana, India). **Analysis of some important factors affecting sorption on fumigants by food commodities.** *J. Food Sci. Technol. (Mysore)* 12(1): 1-5; 1975. (44 references)

Factors affecting the sorption of fumigants by food commodities are analyzed. Under a given set of conditions, sorption determines the dosage of fumigant to be applied because the amount of fumigant used must be sufficient to satisfy total sorption during treatment and also to leave enough free gas to kill insects. The rate and amount of sorption of a fumigant are influenced by several factors. Sorption of a fumigant tends to increase with an increase in temperature, moisture content, or exposure period with a reduction in particle size of the commodity through cracking, grinding, or milling factors. Pressure, load factor, and chemical nature of the commodity also affect sorption. Fumigants must be tested under different conditions with each commodity concerned before recommendations for treatment can be made.

75-2343. Nishimura, M. (Sch. Hyg., Tokyo Dental Coll., Tokyo, Japan). [**Pesticide residues in foods.**] *Koshu Eisei (J. Pub. Health)* 39(6): 357-366; 1975. (Japanese)

A brief description is presented of the Japanese experience with pesticide residues, such as DDT in human adipose tissue via animal products, mercury in rice, and BHC in dairy products; and causes of pesticide residues are discussed. A detailed description is given of pesticide residues which cause food pollution problems. Some of these are organomercury fungicides abundantly applied on mice pollution problems. Some of these are organomercury fungicides abundantly applied on rice plants; organochlorine insecticides and herbicides, including polychlorocyclodienes; DDT and BHC, especially β-BHC; sodium pentachlorophenate; and organophosphorus insecticides and fungicides which are applied just before or after harvest. After indicating FAO/WHO acceptable daily intake values, the Japanese standards for 21 pesticide residues on/in 46 crops or crop parts is tabulated.

75-2344. Kaku, T. (Author address not given). [**Epidemiological study on organochlorine pesticide pollution.**] *Kurume Igakkai Zasshi (J. Kurume Med. Assoc.)* 36(12): 1143; 1974. (Japanese)

Results of a 1971 survey on organochlorine pesticide residues in human blood plasma are presented for 176 inhabitants in the Fukuoka Prefecture. The average concentrations of β-BHC, *p,p'*-DDE, and *p,p'*-DDT were 57.74, 20.42, and 8.43 ppb, respectively; levels were found to be generally higher for males than for females. The β-BHC level in Fukuoka inhabitants was 825 times more than that reported in Idaho inhabitants, 44 times more than in Uta inhabitants, and 15 times more than in Georgia inhabitants. The residual DDT level was similar to that reported in Americans. The β-BHC level for female city dwellers was higher than that for inhabitants of farm village.

75-2345. Juszkiewicz, T.; Stec, J. (Zakl. Farmakol. Toksykol., Inst. Weter., Pulawy, Poland). **Pozostalosci insektycydow polichlorowych w tkance tluszczowej kurczat-broilerow pochodzacych z pieciu roznych krajow.** [**The residue of polychlorinated insecticides in the fat of broiler chickens from five different countries.**] *Med. Weter.* 29(4): 229-231; 1973. (11 references) (Polish)

Thin-layer chromatography and electron capture gas chromatography were used to analyze chlorinated hydrocarbon insecticide residues in the abdominal fat of 110 broilers. The chickens were received from Denmark, Holland, West Germany, Hungary, and Poland. Extracts produced residues of *p,p'*-DDT, *p,p'*-DDE, *p,p'*-DDD (TDE), γ-BHC, α-BHC, aldrin, and dieldrin. Though found in all samples, DDT and γ-BHC reached the highest level in German broilers (0.03 mg/kg and 0.092 mg/kg, respectively) and the lowest level in Danish broilers (0.12 mg/kg and 0.013 mg/kg, respectively). West German and Hungarian broilers revealed detectable residues of α-BHC, and aldrin and dieldrin residues were detected in all but Polish broilers. Residue levels were low as compared with FAO/WHO recommendations.

75-2346. Luquet, F. M.; Goursaud, J.; Casalis, J. (Ecole Natl. Super. des Ind. Agric. et Aliment., Douai Cedex, France). **La pollution des laits humains francais par les residus d'insecticides organochlores.** [**Pollution of human milk in France with organochlorine insecticides residues.**] *Pathol. Biol.* 23(1): 45-49; 1975. (16 references) (French)

A monthly analysis of milk mixtures from 10 French human milk banks (for 2 yr) revealed significant organochlorine insecticide pollution. Residues of hexachlorocyclohexane and hexachlorobenzene (2.75 mg/kg of pure fat), DDT and derivatives (3.24 mg/kg), heptachlor epoxide (0.28 mg/kg), and dieldrin (0.23 mg/kg) were found. Average values of major insecticides detected were: β-hexachlorocyclohexane (β-BHC), 1.67 mg/kg fat; hexachlorobenzene (HCB), 0.98 mg/kg; and dichlorodiphenyldichloroethylene (DDE), 2.40 mg/kg of fat. All milks were heavily polluted, but the geographic location of the milk banks produced some qualitative differences. BHC was the main pollutant south of the Loire river; heptachlor epoxide and dieldrin were high in areas north of the Seine. A special study of human milk from Lille revealed a 50% reduction of pollutants between 1970 and 1973. Human food and the domestic misuse of pesticides are cited as probable contamination routes.

75-2347. Zamfir, G.; Nastase, V. (Hyg. Pub. Health Inst., Iassy, Romania). **Protection of drinking water sources against modern pollutants.** *J. Hyg. Epidemiol. Microbiol. Immunol.* 19(1): 5-9; 1975.

Government planning is required to protect human water supplies from modern environmental pollutants such as pesticides, surfactants, aromatic polycyclic hydrocarbons, oil wastes, phenolics, and radioactive isotopes. Instances of such substances, particularly pesticides and industrial residues, in ground waters have been reported with increasing frequency. Such pollution occurs as a result of storage on the ground surface, disposal of waste products containing these substances on or in the soil, and waste discharge into surface waters. The presence of these substances in most water supply systems, the inability of public water works to effectively remove them, the continual increase in the number of sources of these pollutants, and their contribution to a number of chronic diseases in humans makes solution of this pollution problem imperative.

75-2348. Graca, I.; Silva Fernandes, A. M. S.; Maurao, H. C. (Direccao-Geral, Serv. Agric., Lab. Fitofarmacol., Oeiras, Portugal). **Organochlorine insecticide residues in human milk in Portugal.** *Pestic. Monit. J.* 8(3): 148-156; 1974. (23 references)

A total of 222 samples of human milk collected in several parts of Portugal were analyzed by gas chromatography in 1970 and 1972. The highest rate of insecticide contamination was observed in the 1970 study in a sample taken from an employee who for 6 years had been cleaning glass equipment used in the analysis of pesticide formulations. Her milk contained 1.38 ppm total DDT 73 days after her child had been delivered. DDT, the most frequently detected insecticide, was found in 99.5 percent of the samples. Mean residues of total DDT were similar to those of other European and North American countries. Dieldrin was detected in 15 samples; values ranged from 0.005 to 0.031 ppm. In the 1972 study, *p,p'*-DDE residues ranged from 0.006 to 0.699 ppm and *p,p'*-DDT residues ranged from 0.003 to 0.345 ppm. The highest mean value of total DDT, 0.326 ± 0.175 ppm, was from the district of Lisbon. Potatoes, fruits, and vegetables were the most important items in the women's diets except in coastal districts where the staple was fish. Most of the participating women were homemakers. (Author abstract by permission)

75-2349. Crump-Wiesner, H. J.; Feltz, H. R.; Yates, M. L. (Off. Water Programs Oper., EPA, Washington, DC 20460). **A study of the distribution of polychlorinated biphenyls in the aquatic environment.** *Pestic. Monit. J.* 8(3): 157-161; 1974. (13 references)

Data gathered from monitoring activities and project studies indicate the ubiquitous occurrence and distribution of polychlorinated biphenyls (PCBs) in the aquatic environment. By 1972 residues had been detected in samples from 19 states representing nearly every region of the country. These findings permit a preliminary assessment of PCB contamination across the nation: concentrations ranged from 0.1 to 4.0 μg/liter in unfiltered water samples and from 5.0 to 3,200 μg/kg in bottom sediments. PCB residues were also found in fish and aquatic plants. Samples were prepared by the same techniques used for general chlorinated insecticide detection, with special attention to cleanup and separation of PCBs from other compounds. Basic identification and quantification were made by dual-column electron-capture/gas-liquid chromatography and confirmed by gas-liquid chromatography/mass spectrometry whenever possible. In sediment samples from a south Florida drainage ditch, polychlorinated naphthalenes (PCNs) were observed. This is possibly the first evidence of PCNs in an environmental sample and illustrates the importance of developing analytical capability for the surveillance of other organochlorine compounds that may behave like chlorinated hydrocarbon pesticides. The sampling program is broadening geographically and gradually increasing to more adequately define the distribution of PCB residues in major drainage basins of the United States. (Author abstract by permission)

75-2350. Clegg, D. E. (Anim. Res. Inst., Dep. Primary Ind., Queensland, Australia). **Chlorinated hydrocarbon pesticide residues in oysters (*Crassostrea commercialis*) in Moreton Bay, Queensland, Australia, 1970-72.** *Pestic. Monit. J.* 8(3): 162-166; 1974. (6 references)

A 2-year survey was carried out to monitor levels of DDT, DDD, DDE, and dieldrin in oysters (*Crassostrea commercialis*) in Moreton Bay, Queensland, Australia. Samples were taken at quarterly intervals from eight stations located at or near the mouths of streams entering the bay. Highest levels of 0.94 ppm DDT, 0.51 ppm DDD, 0.20 ppm DDE, and 0.34 ppm dieldrin were found in July 1970 at the sampling station on the Brisbane River 16 km downstream from the center of Brisbane, a city of 700,000. Maximum values at other stations were substantially lower. Residue levels varied considerably throughout the 2-year period. Authors attribute this at least in part to seasonal rainfall patterns in the catchment areas. (Author abstract by permission)

75-2351. Petrocelli, S. R.; Anderson, J. W.; Hanks, A. R. (Bionomics Marine Lab., Pensacola, FL 32507). **DDT and dieldrin residues in selected biota from San Antonio Bay, Texas—1972.** *Pestic. Monit. J.* 8(3): 167-171; 1974. (29 references)

A total of 240 samples of 10 species of selected biota from San Antonio Bay, Tex., were collected and analyzed by electron-capture/gas-liquid chromatography for residues of the organochlorine insecticides DDT and its metabolites, and dieldrin. The most common residue detected was *p,p'*-DDE, which was the only member of the DDT group found in most samples. Results indicated that the DDT/dieldrin load in the biota sampled was relatively low; the greatest concentration was 106 ppb DDT in an oyster. Blue crabs had the greatest incidence of contamination, especially by DDE. Incidence of dieldrin contamination in blue crabs, oysters, and clams was similar. Of the major groups sampled, shrimp had the lowest incidence of DDT/dieldrin residues. (Author abstract by permission)

75-2352. Schultz, D. P.; Harman, P. D. (Southeast. Fish Control. Lab., Fish Wildl. Serv., Warm Springs, GA 31830). **Residues of 2,4-D in pond waters, mud, and fish, 1971.** *Pestic. Monit. J.* 8(3): 173-179; 1974. (15 references)

Nine ponds in Florida, Georgia, and Missouri were treated in 1971 with the dimethylamine salt of 2,4-dichlorophenoxyacetic acid (DMA-2,4-D) to determine residue levels of the herbicide in water, bottom mud, and fish as a function of application rate, time, substrate, and geographic location. The acid equivalent of 2,4-D was applied at treatment rates of 2.24, 4.48, or 8.96 kg/ha. Samples were taken up to 147 days after treatment. Residues of 2,4-D in pond waters declined from a maximum of 0.345 and 0.692 mg/liter in Florida and Georgia, respectively, to less than 0.005 mg/liter 28 days after treatment, and from 0.630 mg/liter to less than 0.005 mg/liter 56 days after treatment in Missouri pond waters. Residues in mud from the Florida and Georgia ponds never exceeded 0.05 mg/kg and had declined to trace or nondetectable levels 56 days after treatment. The highest residue found was 0.170 mg/kg from the first- and third-day samples of mud in the most heavily treated Missouri pond. In mud from one Missouri pond, residues were detected as late as 28 days after treatment; no residues occurred in any ponds after that. No evidence of fish kill was found in any ponds treated with DMA-2,4-D. Of 307 fish samples analyzed, 45 contained detectable residues of 2,4-D. Residue levels ranged from slightly more than 1.0 mg/kg to less than 0.010 mg/kg. (Author abstract by permission)

75-2353. Clark, D. E.; Smalley, H. E.; Crookshank, H. R.; Farr, F. M. (Vet. Toxicol. Entomol. Res. Lab., Agric. Res. Serv., U.S.D.A., College Station, TX 77840). **Chlorinated hydrocarbon insecticide residues in feed and carcasses of feedlot cattle, Texas—1972.** *Pestic. Monit. J.* 8(3): 180-183; 1974. (14 references)

Residues of several chlorinated insecticides in fat samples from calves that had been on controlled feed for 112 days were compared with residues in their feed. Both feed and fat samples contained lindane, dieldrin, DDT, DDE, and DDD. Except for dieldrin, each insecticide was found in higher levels in fat than in feed. Addition of

ammonium sulfate and ammonium chloride as sources of nonprotein-nitrogen did not affect accumulation of residues. Average residue levels found in composite feed samples were: lindane, 0.002 ppm; DDE, 0.022 ppm; dieldrin, 0.029 ppm; DDD, 0.032 ppm; and DDT, 0.083 ppm. Average residue levels found in the fat were: lindane, 0.026; DDE, 0.261 ppm; dieldrin, 0.030 ppm; DDD, 0.101 ppm; and DDT, 0.292 ppm. (Author abstract by permission)

75-2354. Frank, R.; Montgomery, K.; Braun, H. E.; Berst, A. H.; Loftus, K. (Provincial Pestic. Residue Testing Lab., Ontario Minist. Agric. and Food, Guelph, Ontario, Canada). **DDT and dieldrin in watersheds draining the tobacco belt of southern Ontario.** *Pestic. Monit. J.* 8(3): 184-201; 1974. (18 references)

Production of flue-cured tobacco in Ontario is concentrated mainly in four watersheds adjacent to Norfolk County on the north shore of Lake Erie, where tobacco is raised on a sandy loam soil using a 2- and 3-year rotation with cereals and corn. In 1961-69 an average amount of 4.4 kg/ha DDT was used to control soil and foliar insects attacking tobacco. In 1970-71, DDT was restricted to the control of soil insects only; applications averaged 1.7 kg/ha. Residue data from soil samples collected in 1971 indicated total levels of 325,000 kg ΣDDT and 14,000 kg dieldrin in the entire tobacco-growing area. These residues represented 37 percent of the total DDT application to the area since 1961, and were calculated to agree with the half-life disappearance of 3-4 years. Residue analysis of the tobacco crop in 1971 (42 million kg cured leaf) revealed that 52.6 kg ΣDDT and 1.97 kg dieldrin had been removed from the soil. This represents 0.18 percent of the DDT applied in 1971 or 0.03 percent of the ΣDDT and dieldrin resident in the soil the same year. Corn silage and hay were calculated to contain 38.3 kg DDT and 0.76 kg dieldrin, but these residues remained in the watershed because the crops were used as feed for livestock. Animal products leaving the watershed in 1971 amounted to 54 million kg milk and 6 million kg meat which contained only 0.95 kg ΣDDT and 156 g dieldrin. Total water discharging into Lake Erie from the four watersheds was calculated to carry 12.6 kg ΣDDT and 0.86 kg dieldrin in the water and on suspended sediments, representing 0.002 percent and 0.003 percent, respectively, of the ΣDDT and dieldrin resident in the four watershed soils. Fish species caught in Big and Dedrich Creeks contained residues 4 to 15 times higher than those of species from Long Point Bay and Lake Erie, reflecting the rapid dilution of the creek waters within 3 miles of the mouths of these creeks. Lowest pesticide concentrations in fish were about the same as the concentrations in water-suspended sediments. Magnification observed from water to the highest concentrations in large fish was approximately 10^5; however, the tissue residue did not exceed the 5 ppm tolerance established in fish. Residues in air appeared to be the result of either spray drift or airborne soil particles rather than volatilization from the soil. (Author abstract by permission)

75-2355. Jackson, M. D.; Sheets, T. J.; Moffett, C. L. (Pestic. and Toxic Substances Effects Lab., EPA, Research Triangle Park, NC). **Persistence and movement of BHC in a watershed, Mount Mitchell State Park, North Carolina-1967-72.** *Pestic. Monit. J.* 8(3): 202-208; 1974. (15 references)

An experimental area in Mount Mitchell State Park, North Carolina, was sprayed with BHC, benzene hexachloride, at an average rate of 11.2 kg/ha to control the balsam woolly aphid (*Adelges piceae*). Residues were 31 and 585 ppm in soil and litter, respectively, 1 month after spraying. A high percentage of the residue appeared to remain in the treated area; contamination of streams draining the area was minimal. BHC present in surface litter after application slowly moved into surface soil. The residue level in surface soil reached a high of 58 ppm 1.5 years after application. At this time the concentration in litter averaged 134 ppm. Residues in soil and litter were 32 and 27 ppm, respectively, 5 years after application. Concentrations of BHC in animals were unrelated to trapping locations. (Author abstract by permission)

75-2356. Starr, H. G., Jr.; Aldrich, F. D.; McDougall, W. D., III; Mounce, L. M. (Colorado Epidemiol. Pestic. Study Cent., Colorado State Univ., Fort Collins, CO 80523). **Contribution of household dust to the human exposure to pesticides.** *Pestic. Monit. J.* 8(3): 209-212; 1974. (8 references)

Preliminary analysis of environmental contributions to pesticide body burden revealed household dust as a major reservoir of pesticides in the environment. A year-long monthly study of the households of pesticide-exposed persons and control households in Weld County, Colo., in 1968 revealed appreciable levels of selected chlorinated pesticides in the exposed group. Exposed subjects varied from entire farm families with high agricultural use of pesticides to households with at least one member who formulated pesticides, either as an employee of a local plant or as a professional applicator who mixed and loaded pesticides for commercial use. In the overall data no quantitative relationships were demonstrated between pesticide levels in household dust and pesticide levels in blood, although circumstantial data from individual households indicate that a certain connection does exist. No correlation could be shown between levels of *p,p'*-DDT and *p,p'*-DDE in household dust. Pesticide levels in the dust indicate a probable influence on body burden contributing to total environmental exposure of the individual to pesticides. (Author abstract by permission)

75-2357. Grover, R.; McCashin, B. (Herbicide Behavior Environ. Sect., Res. Stn., Agric. Canada, Regina, Saskatchewan, Canada). **A nomograph for the conversion of 2,4-D ester concentrations in air from $\mu g/m^3$ to ppbv and vice versa.** *Pestic. Monit. J.* 8(3): 213-215; 1974. (7 references)

A nomograph for the conversion of 2,4-D (2,4-

dichlorophenoxyacetic acid) ester concentrations from $\mu g/m^3$ to ppbv and vice versa has been prepared to provide a simple and direct means for such conversions. Results obtained are shown to be comparable to those calculated. (Author abstract by permission)

75-2358. Gutierrez, J. M. (Cadiz School of Medicine, Cadiz, Spain). **Ictiosarcotoxismo: un riesgo medico y sanitario de la fauna maritima.** [**Ichthyosarcotoxism, a sanitation risk connected with marine fauna.**] *Rev. Sanid. Hig. Pub.* 44: 1055-1112; 1970. (144 references) (Spanish)

After discussing 4 classic types of fish poisoning, attention is given to 2 more recent dangers related to the marine biotope: contamination caused by hydrocarbons and by insecticides. Jensen et al. found considerable amounts of insecticide residue in the Baltic Sea, especially the Gulf of Bothnia; the area was described as "a large reservoir of insecticide residues." Most frequently encountered are the polychlorinated biphenyls (PCB), metabolites of the chlorinated insecticides that are more persistent than DDT itself. The study included 6 species of fish, 3 of seals, and 3 of birds. PCBs have also been found in edible mussels in Germany and England and in bears in Canada and The Netherlands. Animal experiments with the PCB indicate potential toxicity and teratogenicity, and they are known to affect hepatic enzymes. Odum et al. analyzed 45 fiddler crabs from a river on Long Island where they fed on detritus containing DDT, DDD (TDE), and DDE residues. Behavior was altered to the extent that survival of the species was threatened, and "biological magnification" posed a threat to human consumers.

75-2359. Hernandez Cochon, J. M.; Moreno Martinez, P.; Najera, E. (Oficio Provincial de Sanidad, Coruna, Spain). **Estudi sobre la depuracion natural de pescados y mariscos despues de la contaminacion accidental por dieldrin.** [**Study on natural decontamination of fish and mussels following accidental contamination with dieldrin.**] *Rev. Sanid. Hig. Pub.* 46: 437-451; 1972. (1 reference) (Spanish)

A shipwreck in the Bay of La Coruna in November 1970 resulted in the discharge of large amounts of toxic chemicals into the bay waters and serious damage to wildlife in the area. The present study was performed to determine suitability of fish and shellfish for human consumption and to predict the course of natural decontamination. At the time of maximum contamination the waters of La Coruna contained dieldrin at 0.0900 ppm and various mercurial compounds at about 0.66 ppm. The dieldrin levels in clams at Ria de la Coruna declined from abut 0.9 ppm immediately after contamination to about 0.1 ppm in May 1971; levels in mussels decreased from about 1.8 ppm to 0.08 ppm during this period. Molluscs farther from the source of contamination contained lower dieldrin levels. If an acceptable contamination level of 0.04 ppm is established for molluscs, the specimens from the less contaminated areas would be fit for human consumption after about 100 days and those from the more heavily exposed area at about 220 days after contamination. Uncertainty of measurement suggests that an additional safety factor of 20-40 days should be allowed.

75-2360. Weston, R. E. (Lab. Government Chem., London, England). **The monitoring of chemical contaminants in food.** *Toxicology* 4(3): 391-393; 1975. (2 references)

The United Kingdom operates a highly effective procedure for the control and use of pesticides which relies upon the voluntary cooperation of the manufacturer and user. Recently, the Working Party on the Monitoring of Foodstuffs for Heavy Metals has been set up to collect data on trace metallic contaminants in foodstuffs. Reports have been published on the monitoring exercises for mercury, lead, and cadmium, and recent studies have been extended to include surveys on mercury and polychlorobiphenyls. Food groups which are particularly susceptible to contamination are identified, as are geographical variations in the levels of contamination. The data have indicated that the average intakes of DDT and dieldrin in the UK are well below WHO's recommended ADIs and are decreasing, as are the levels of these residues in human fat. In addition, no serious hazards are considered to arise from organophosphorus pesticide and PCB residues. Other contaminants which have been studied include the chlorinated phenols, polynuclear aromatic hydrocarbons, and nitrosamines; the latter are seldom found in foodstuffs in concentrations exceeding 5 ppb.

75-2361. Moore, D. G.; Hall, J. D.; Hug, W. L. (Author address not given). **Endrin in forest streams after aerial seeding with endrin coated Douglas fir seed.** *U. S. For. Serv. Res. Note PNW* 219: 2-14; 1974. (22 references)

The extent and duration of endrin contamination in stream water was determined after aerial seeding of two western Oregon watersheds with treated Douglas-fir seed. Watershed No. 1 was seeded with 0.56 kg of 0.5% endrin-coated Douglas-fir seed/ha, while the second watershed (low gradient stream) was seeded with 0.84 kg/ha of 1.0% endrin-coated seed. The steep gradient of the stream channel in Watershed 1 resulted in the highest concentration of endrin (0.070 ppb) being measured 15 min after seeding started. Concentrations of endrin in the water changed rapidly, and the peaks coincided with the flight pattern of the helicopter. All detectable quantities of endrin in the stream were found in the first 5 hr after seeding began. Endrin was not detected in samples from the second watershed until 6 hr after seeding started. The peak concentration of 0.013 ppb was reached in 21 hr, and residues remained near that level for 3 days. Concentrations then dropped to 0.002 to 0.004 ppb for the next 5 days. Measurable amounts of endrin were again detected during the high flow of a winter freshet 3 wk after seeding. Maximum concentrations measured were well below reported 96 hr median tolerance limits for important fish species.

75-2362. Prosic, Z.; Marcetic, N.; Piletic, V. (Acad. Military Med., Coll. Hyg., Yugoslavia). **Opadanje sadrzaja organofosfata u toku skladistenja brasna i njegove prerade. [Decline of the organothiophosphate content of flour during storage and processing.]** *Vojnosanit. Pregl.* 27(1): 26-29; 1973. (9 references) (Serbo-Croatian)

Four from untreated wheat was contaminated with malathion in concentrations of 5, 10, 50, and 100 ppm, then kept in storage for 13 months. During storage the malathion content was determined every fourth week. Bread was meanwhile made from the flour and its malathion content monitored. Decreases in the malathion content were recorded. These were especially notable in the grain made into bread, the average decline was 55%. The lower the malathion concentration, the greater its decline in both cases. Grain with 5 ppm (five times the permissible concentration) could be utilized in accordance with legal regulations after just two months of storage. Grain with 10 ppm content could be used after a year's storage. The 50 and 100 ppm batches were still not within permissible limits after a year, even though the malathion content had dropped considerably.

75-2363. Gaeb, S.; Cochrane, W. P.; Parlar, H.; Korte, F. (Gesellschaft Strahlen Umweltforsch. mbH, Inst. Oekol. Chem., Munich, Germany). **Photochemische Reaktionen von Chlorden-Isomeren des technischen Chlordans. [Photochemical reactions of chlordene isomers of technical chlordane.]** *Z. Naturforsch.* 30b(2): 238-244; 1975. (German)

Isomers of chlordane(α, β, and γ-chlordene) were studied in solution to determine photochemical behavior. UV-irradiation in methanol resulted in direct excitation that leads to $[2\pi + 2\pi]$-photocycloaddition and photodechlorination reactions. The proposed structures of the photoproducts were supported by spectroscopic data using MS, IR, and PMR methods. The insecticidal properties of several products of photoisomerization and photodechlorination reactions were measured and compared with those of the original compounds. Those tested included: α-chlordene, γ-chlordene, photo-α-chlordene, photo-γ-chlordene, monodechloro-α-chlordene, monodechloro-β-chlordene, monodechloro-γ-chlordene, and parathion.

75-2364. Ostojic, N.; Starovic, N.; Zigic, M. (Plant Protection Institute, Belgrade, Yugoslavia). **Mobilnost nekih oranofosfornih insekticida i lindana u raznim tipovima zemljista. [Mobility of lindane and certain organophosphorus insecticides within certain soil types.]** *Zast. Bilja* 23(121): 285-291; 1972. (7 references) (Serbo-Croatian)

The mobility of three insecticides (lindane, diazinon, phorate) was tested in three types of soil (forest soil, degraded chernozem, black muck) using the thin-layer chromatography method described by Inch. The lindane (99.9% γ-isomer) was extracted with acetone and hexane and detected by gas chromatography, using a Varian Aerograph with electron capture detection. The organophosphorus compounds were extracted with acetone and detected by spectrophotometry, method of Melvin and Getz. Diazinon was found to have the highest soil mobility, followed by phorate. Mobility is especially high in forest soil as compared with the other types tested, but soil type was not an important factor in the case of diazinon.

75-2365. Hernandez, E.; Martinez, R. M.; Martinez, M.; Terol, J. F. (Agrochemistry and Food Technology Institute, Valencia, Spain). **Proteccion de frutos citricos contra la putrefaccion mediante tratamientos con 1-(butilcarbamoil) benzimidazol-2-carbamato de metilo, (benomyl); residuos del fungicida en los frutos tratados. [Protection of citrus fruit with benomyl against decay; fungicide residues in treated fruit.]** *Rev. Agroquim. Technol. Aliment.* 11(12): 249-259; 1971. (6 references) (Spanish)

A study was made of the effectiveness of benomyl (methyl 1-butylcarbamoyl benzimidazole - 2 - carbamate) against molds (especially *Penicillium*) causing decay in citrus fruit, allowing for the influence of concentration and other factors. Washington navel and late Valencia type oranges were used for the experiments. Results were compared with those obtained from treatment with sodium orthophenylphenate and 2-aminobutane. They also determined benomyl residue in the fruit after treatment and a period of growth. Data indicated a heavy fungicidal action against *Penicillium*, also a high persistence of residue: 30 days after treatment, skin content of the fruit was still 60% of initial concentration. Benomyl was found to be more effective in its function than the other fungicides, even after washing. No benzomyl residue was found in the pulp of treated fruit. No skin blemishes or flavor changes could be attributed to the action of this fungicide.

75-2366. Murado-Garcia, M. A.; Baluja-Marcos, G. (General Organic Chemistry Institute, Madrid, Spain). **Metabolismo de aldrin por "*Penicillium funiculosum*". [Aldrin metabolism effected by *Penicillum funiculosum*.]** *Rev. Agroquim. Tecnol. Aliment.* 13(4): 559-566; 1973. (12 references) (Spanish)

Extracts of *Penicillium funiculosum* cultures, isolated from agricultural soil and incubated in solid and liquid media containing variable concentrations of the organochlorine insecticide aldrin (HHDN), were studied by gas-liquid chromatography. These were found to have undergone a partial transformation to dieldrin and to 2 metabolites (M_1 and M_2) not fully identified by chromatography. The latter were isolated, purified by adsorption chromatography, and studied with an IR spectrophotometer and mass spectrometer, whereupon M_1 was identified as a ketoaldrin. It was shown that there are 2 different metabolic routes taken in aldrin metabolism performed by the test fungus, one proceeding directly to the formation of dieldrin, the other producing the metabolite M_1, which in turn is partially converted to M_2. Also demonstrated was

the influence of the initial concentration of insecticide on the degree of conversion and on the predominance of a given metabolic route.

75-2367. Dep. of Pest Control. (Hiroshima Pref. Agric. Exp. Stn., Higashi-Hiroshima, Hiroshima, Japan). **Determination of pesticide residues.** *Business Rep., Hiroshima Pref. Agric. Exp. Stn.*, 1974, p. 26. (Japanese)

The effect of active carbon soil treatment was studied on the repressing absorption of organic phosphorus insecticides such as disulfoton granules, hosdon (isothioate) granules, orthoran granules, and chlorfenvinphos granules which had been incorporated in soil. Residue levels in soil were determined. The residual amount of the insecticide in leaf and root of Japanese radish was reduced by the soil treatment with active carbon; however, the residue levels in soil were greater than usual.

75-2368. Cocisiu, M.; Nistor, C.; Aizicovici, H.; Pencesu, E.; Alexandrescu, D.; Manuca, M.; Iordachescu, D. (I.I.S.P., Iasi, Romania). **Reziduuri de insecticide organoclorate—DDT si HCH—in prinzuri totale si in probe de lapte de vaca. [Residues of organochlorine insecticides (DDT and HCH) in total diet and in samples of cow's milk.]** *Igiena* 24(2): 83-86; 1975. (11 references) (Romanian)

Residues of DDT, DDE, and HCH (BHC) were analyzed in 116 samples of milk and 111 of total diet in two rural areas (A and B). Area A showed higher residue levels than area B. Values obtained showed: DDT (0.118 ppm in milk and 0.067 mg/day in diet - area A; 0.060 ppm in milk and 0.055 mg/kg in diet - area B); HCH (0.255 ppm in milk and 0.272 mg/day in diet - area A; 0.124 ppm in milk and 0.083 mg/day in diet - area B). The amounts of insecticides used in agriculture in the two test areas correlated with the above results.

75-2369. Balinov, I. (Inst. Plant Protect., Kostinbrod, Bulgaria). **Opredelyane na ostat'chnite kolichestva ot DDT i negovite metabolitni produkti v yab'lkovite gradini. [Determination of DDT residues and metabolic products in apple orchards.]** *Gradinar. Lozar. Nauka* 10(8): 43-50; 1973. (16 references) (Russian)

An orchard that had been sprayed twice yearly with DDT (20% powder in the form of 2% suspension) against each codling moth (*Carpocapsa pomonella*) generation was examined 7 yr after treatments ceased. Soil and apple trees were studied in 1971-72 by gas chromatography and thin-layer chromatography. It was found that nearly 288 kg/ha technical DDT had been applied during the 15 yr of spraying. About 10.6% of this amount was found in the alluvial-meadow type soil which had been kept under grass and had a low sorption capacity. DDE, *p,p'*-DDT, and *o,p'*-DDT were found in the soil with both detection methods. About 79% and 97% of the total DDT residue was found in the 0-10 and 0.30 cm soil layers, respectively. To a depth of 30 cm, one kg soil contained 6.76 mg total DDT. Large amounts of the preparation and its metabolic products were detected in the branches and leaves and very unsubstantial ones (0.011 mg/kg) in the peelings.

See also **75-2500**

75-2370. Katja, W.; Plestina, R.; Svetlicic, B. (Med. Res. and Occup. Health Inst., Yugoslav Acad. Arts Sci., Zagreb, Yugoslavia). **Aktivnost kolinesteraza u krvi radnika izlozenih organskom fosfornom insekticidu Ekatinu. [Blood cholinesterase activity of workers exposed to the organophosphorus insectide Ekatin.]** *Arh. Hig. Rada Toksikol.* 24(2): 107-116; 1973. (15 references) (Serbo-Croatian)

In a factory making the insecticide Ekatin (20% thiometon) from a 50% solution of the active principle, a six-week surveillance was conducted on a group of 16 workers (6 female, age range 25-50; six employed 5 years or more, 4 others for at least a year) involved in 7 areas of production. This consisted of determining their plasma and blood cholinesterase activity rates by the Ellman, tintometer, and Aholest methods. The main test was preceded by a toxicity determination of the 50% concentrate and in vitro testing of its inhibitory properties vis-a-vis human blood cholinesterase. From this preliminary data, an estimate was made of the risk involved at each level of production. Final test results indicated that the highest risk was incurred in the labeling department. Recommendations are made for the implementation of prevention measures.

75-2371. Kevan, P. G. (Res. Unit. Vector Pathol., Mem. Univ. Newfoundland, St. John's, Newfoundland, Canada). **Forest application of the insecticide fenitrothion and its effect on wild bee pollinators (Hymenoptera: Apoidea) of lowbush blueberries (*Vaccinium* spp.) in southern New Brunswick, Canada.** *Biol. Conserv.* 7(4): 301-309; 1975. (30 references)

Fenitrothion has been used as a larvicidal spray against the spruce budworm (*Choristoneura fumiferana* (Clem) Lepidoptera: Tortricidae) over wide areas of forest in New Brunswick, Canada since 1969. Since the native wild bees are the important pollinators of lowbush blueberries in that region, the effects of the insecticide applications on the bees were studied. The work was conducted in June 1972 on blueberry fields across southern New Brunswick. Samples of living and dead wild bees were studied. The bee populations appear to have been severely reduced in fields within areas adjacent to where fenitrothion has been used, and insecticide residues have been found in the carcasses of both honey bees and the native wild bees. Based on this evidence, the known toxicity of fenitrothion to bees, and the area covered by their foraging ranges, it is concluded that the New Brunswick blueberry fields and their immediate environs received doses of the pesticide. Because blueberries require outcrossing by bees, it is believed that recent crop failures have, in part, been caused by drifts and/or indiscriminate applications of fenitrothion and the resulting reductions in the native bee populations.

75-2372. Texier, L.; L'Epee, P.; Lazarini, H. J.; Ducombs, G.; Doignon, J.; Larcebeau, S.; Miegeville, M. J. (Clin. dermatol., Hopital Saint-Andre, Bordeaux, France). **L'intoxication arsenical chronique et son indemnisation. L'arsenicisme cutane d'evolution tardive. Les cancers arsenicaux. [Chronic arsenic poisoning and its indemnification. Late evolution of cutaneous arsenicism. Arsenical cancer.]** *Bordeaux Med.* 1(10): 1539-1544; 1974. (French)

Cases of chronic arsenic poisoning were studied to determine clinical symptomatology, possible evolution of local cancer, and the development of visceral neoplasm. Conclusions were based on the observation of eight persons and the case histories of an additional eighteen. Clinical symptomatology consisted of hyperkeratosis and hyperchromia. Poisoning was often therapeutic through the use of Fowler's liqueur in many Anglo-Saxon countries or occurred as a result of the use of arsenic as a pesticide in wine-growing regions, especially in Aquitaine. Arsenic poisoning may take some time to manifest itself and appear unrelated to any direct incident. Unfortunately, there is no legal indemnity for arsenical lesions which appear belatedly. Indemnity tables for arsenic poisoning should be revised and completed in the light of recent findings.

75-2373. Sutterlin, A. M. (Environ. Canada, Biol. Stn., St. Andrews, New Brunswick, Canada). **Pollutants and the chemical senses of aquatic animals—perspective and review.** *Chem. Senses Flavor* 1(2): 167-178; 1974. (86 references)

Man-made alterations in the quality of coastal and inland waters have subjected aquatic animals to great changes. Chemoreceptive membranes, olfactory and gustatory, have probably evolved a certain degree of compatability with their external chemical environment which enables the animals to cope with a wide variety of naturally occurring compounds. This review considers the importance of chemical communication in aquatic animals, the possible types of interactions between pollutants and chemosensory system resulting in disturbances in behavior patterns, methods used in studying some of these interactions, and a survey of the literature by pollution types.

75-2374. Richardson, J. A.; Keil, J. E.; Sandifer, S. H. (Dep. Pharmacol. Preventive Med., Med. Univ. South Carolina, Charleston, SC 29401). **Catecholamine metabolism in humans exposed to pesticides.** *Environ. Res.* 9(3): 290-294; 1975. (13 references)

Plasma levels of epinephrine (E) and norepinephrine (NE) and 24-hour urinary excretion rates of E, NE, total metanephrines (M), and 3-methoxy-4-hydroxy-mandelic acid (VMA) were compared in 20 control subjects and in 23 persons exposed intensively to a mixture of DDT, parathion, and carbaryl. All subjects were male; 22 were white and 21 nonwhite. In the exposed group, total plasma DDT was 38.9 ppb and red cell cholinesterase was 11.99 μM/min/ml as compared, respectively, with 6.7 ppb ($P<0.005$) and 13.65 μM/min/ml ($P<0.05$) in the controls. Plasma levels and excretion rates of E were significantly lower in exposed than in control subjects. Excretion rates of NE,

M, and VMA, as well as plamsa levels of NE, were similar in the two groups. Systolic blood pressure correlated significantly with total plasma DDT ($R=0.55$). Systolic and diastolic pressures were negatively correlated with red cell cholinesterase ($R=-0.39$). These results in humans are not consistent with previously published data in animals, possibly due to species differences, but more likely due to difference in dosage between the animal studies and human exposure. It is suggested that future studies in animals include dose-response curves. (Author abstract by permission of Academic Press)

75-2375. Binenfeld, Z. (Upper Military Technical School, Yugoslav Army, Zagreb, Yugoslavia). **Suvremena gledenja na terapiju trovanja organofosfornim insekticidima. [Recent aspects of the treatment of organophosphorus insecticide poisoning.]** *Farm. Glasnik* 26(1): 1-6; 1970. (5 references) (Serbo-Croatian)

The poisoning action of organophosphorous insecticides is due to the inhibition of cholinesterase, leading to an accumulation of acetylcholine in the nervous system. Atropine can be used to combat the accumulation symptoms, buying time to treat the other problems and to deal with the root problem. Pralidoxime iodide, discovered in 1955 by Wilson and Ginsburg, can be used to reactivate the neutralized cholinesterase but has been found to be of low practical value because of its relative insolubility in water. The same effects can be achieved with pralidoxime chloride and toxogonin (obidoxime), derivatives of the above, which are more soluble. The chloride is recommended for inclusion in the Yugoslav Pharmacopeia.

75-2376. Imaizumi, K.; Koizumi, Y.; Miyashita, H. (Sch. Ophthalmol., Iwate Med. Coll., Morioka, Iwate, Japan). **[A case of organomercury poisoning with sudden visual disturbance.]** *Ganka Rinsho Iho (Jpn. Rev. Clin. Ophthalmol.)* 69(7): 869; 1975. (Japanese)

A case of intoxication by methoxyethyl mercury chloride is reported. The patient is a research worker for a pesticides manufacturer who had handled the fungicide daily during application in a germination experiment. The first symptom experienced was dermatexanthesis, followed by a sudden visual disturbance. Hunter-Russel's syndrome appeared in addition to significant amounts of mercury in the patient's hair and urine. The intoxicant was orally administered to rabbits in order to trace the metabolism of fatty acids in optic tissues to clarify the mechanism of intoxication.

75-2377. Inch, T. D.; Brimblecombe, R. W. (Chem. Defence Establishment, Salisbury, England). **Antiacetylcholine drugs: chemistry, stereochemistry,and pharmacology.** *Int. Rev. Neurobiol.* 16: 67-144; 1974. (205 references)

Antiacetylcholine drugs are used in the treatment of poisoning with anticholinesterase agents. They are usually considered to antagonize the effects of accumulated acetylcholine at central and peripheral muscarinic sites, and so are usually used in conjunction with a reactivator of the inhibited cholinesterase. Recent evidence indicates that at least some antiacetylcholine drugs have other actions, such as on the skeletal muscle, which may also be beneficial in anticholinesterase poisoning. This review discusses the chemical evolution of antiacetylcholine drugs; absolute stereochemistry and antiacetylcholine activity, including dependence of activity on configuration; the use of configurational differences to study mechanisms of drug action; and the conformation features and antiacetylcholine activity. The quantitative correlation of chemical structure and antiacetylcholine drugs are considered. The relative potencies of antiacetylcholine drugs in the central nervous system and peripheral nervous system are discussed. Behavioral studies are included. The use of antiacetylcholine drugs in the treatment of poisoning by anticholinesterase agents is discussed along with drug metabolism and pharmacological methods.

75-2378. Livingston, M. L. (North Palm Beach, FL 33404). **Flea collars not boon to animals.** *J. Am. Vet. Med. Assoc.* 167(1): 13,15; 1975.

The ineffectiveness of flea collars against fleas and their potential harm to the animals are described in a letter-to-the-editor. Animals heavily parasitized by fleas or ticks were observed when wearing flea collars. A severe dermatitis or chemosis of the neck area was present in animals wearing flea collars especially white dogs and cats. The lesions healed upon removal of the collar and with symptomatic treatment. Mild intoxication in cats and dogs was also observed among those wearing flea collars. The animals recovered promptly upon removal of the collars.

75-2379. Heyndrickx, A.; Van Hoof, F.; De Wolf, L.; Van Peteghem, C. (Dep. Toxicol., State Univ. Ghent, Ghent, Belgium). **Fatal diazinon poisoning in man.** *J. Forensic Sci.* 14(2): 131-133; 1974. (9 references)

Postmortem examination of a 65-yr-old woman who had tried to commit suicide by cutting both radial veins revealed an oily, green-colored fluid in the stomach and edema in both lungs. Thin-layer chromatography of extracts of the stomach and small intestinal contents indicated the presence of diazinon. The levels of diazinon in the stomach and small intestinal contents, and in the liver, kidney, brain, and lung tissues were determined using gas chromatography with flame ionization (stomach and small intestinal contents) and thermionic phosphorus detection (liver, kidney, brain, and lung tissues). The diazinon concentrations in these samples were 756 mg% in the stomach contents, 262 mg% in the small intestinal contents, 30 μg% in the brain, 8 μg% in the liver, 4 μg% in the kidney, and 1.5 μg% in the lung. No diazinon metabolites were detected using this technique.

75-2380. Akimov, G. A.; Buchko, V. M.; Kremleva, R. V. (S. M. Kirova Military Medical Academy, USSR). **Nevrolgicheskie napusheniya pri otravlenii khlorofosom. [Neurological disorders in chlorophos poisoning.]** *Klin. Med. (Moscow)* 5: 65-69; 1975. (34 references) (Russian)

Acute p.o. chlorophos (trichlorfon) poisoning was studied in 160 patients. There were 27 cases of mild poisoning, 65 cases of medium severity, and 67 cases of severe poisoning. All patients evidenced symptoms of an anticholinesterase effect of chlorophos. Patients with severe poisoning showed the most drastic changes in the nervous system—consciousness disorders; spasms; disturbances in respiration and cardio-vascular activity and in motor and reflex responses. Low amplitude quick activity persisting for a period of 6-7 and 7-9 days was recorded on the EEG in patients with mild and moderately severe poisoning, during the first day. In patients with severe poisoning, low amplitude slow activity continued for 9-12 days, with consciousness disorders. Thirty-eight patients developed severe polyneuritis in upper and lower extremities after severe poisoning.

75-2381. Misumi, J.; Matsushita, T.; Tomio, T.; Arimatsu, Y. (Sch. Public Health, Fac. Med., Kumamoto Univ., Kumamoto, Japan). **[Health survey of pest control operators exposed to organophosphorus pesticides.]** *Kumamoto Igakkai Zasshi (J. Kumamoto Med. Soc.)* 49(2): 175-184; 1975. (19 references) (Japanese)

A health survey was carried out on 12 male professional pesticide applicators with 2 to 9 yr work experience. Each year, from early May to early September, they used a spraying solution containing 0.5% fenitrothion and 0.2% dichlorvos. Subjective symptoms were forgetfulness, headache, chest pressure sensations, night sweat, nausea, thirstiness, twitching about the eyes, irritation, dizziness, etc. The symptoms were often experienced before application. The content of *p*-nitro-*m*-cresol in urine was highest (average 25.2 μg/19 ml) 7-8 hr after application, and averaged 13.7 μg/10 ml before application. Hematologic, ophthalmologic, lung function, and urinalysis examinations showed no abnormality. Some persons showed abnormal ECG and EEG (sporadic theta wave, and theta-strain, especially after application). After application, some subjects showed redness in the pharynx. No remarkable finding was obtained in internal medical observations.

75-2382. Szabo, S.; Reynolds, E. S.; Moslen, M. T. (Dep. Pathol., Peter Bent Brigham Hosp., Harvard Med. Sch., Boston, MA 02115). **Chemical factors in aetiology of duodenal ulcer.** *Lancet* 2(7924): 73; 1975. (13 references)

Many compounds widely used in industry, agriculture, and medicine produce duodenal ulcers in laboratory animals. The ulcerogenic potential of these drugs in the rat is seemingly related to an ethane backbone bearing cyano, sulfhydryl, amino, or chloro groups on one or both ends of the chain. Branching of the chain or insertion of a hydroxyl group diminishes ulcerogenesis. Various unsaturated homologues and numerous allyl compounds also have adrenocorticolytic activity. It is possible that the geographical distribution of gastroduodenal ulcer disease in man is also related to the presence of various environmental pollutants. For example, propionic acid and other propionates are widely used as mold inhibitors of grain, and fungicides in general have been noted to stimulate the appetite in swine. Such chemicals may be natural or artificial constituents of our food. Epidemiological studies are needed to determine whether such chemicals are related to the etiology of duodenal ulcer in man.

75-2383. Czeizel, A.; Kiraly, J.; Ruzicska, P. (Lab. Human Genet., Natl. Inst. Publ. Health and Budapest Chemical Works, Budapest, Hungary). **Studies on chromosomal mutations in workers producing organophosphate insecticides.** *Mutat. Res.* 29(2): 279; 1975.

The chromosomal mutagenic effect of pesticides containing organic phosphoric acid esters has been demonstrated earlier in patients who had suffered severe acute intoxications due to violating labor-safety measures or attempting to commit suicide. From practical points of view, it is important to clarify whether the various types of chromosome aberrations occur with a frequency higher than usual in persons exposed to chronic small doses of pesticides, e.g., in workers producing the insecticides studied previously. Up to the present, the chromsomes of the peripheral blood cultures of a total of 73 workers have been studied. The results obtained are not unequivocal because, whereas the frequency of chromosomal abnormalities in the study group as a whole was not higher than in the control group, it was higher in some cases and rather high in some others. The collection of further cases and the etiological evaluation of those suspected to have more severe chromsomal injuries are in progress. (Author abstract by permission)

75-2384. Srivastava, S. K. (G. B. Plant Univ. Agric. Technol., Pant Nagar, India). **Some field problems related to the use of pesticides in India.** *PANS (Pest. Artic. News Summ.)* 20(3): 323-326; 1974. (2 references)

Pesticide programs being used on farmer's fields, Government Agriculture Farms, and Extension Training Centres of the District of Saharanpur in India were critically evaluated. In some cases pesticide usage has failed to control diseases and/or insects due to: application of a totally ineffective pesticide; application after the pest or disease has caused significant damage to the crop; poor follow-up of the recommended control schedule; poor selection of pesticides; incorrect method of application; or sole reliance on pesticides in situations where other methods are more effective. Spraying of incompatible chemical mixture, improper calibration, and drift injury were associated with different toxicity hazards to the crops, and illness due to inhalation of pesticides and dermal irritation were common among pesticide operators. It is concluded that the Indian farmer in general lacks educa-

tion concerning the usefulness of prophylactic measures, that the existing machinery of extension pathology is inadequate in quantity,and that the latest information regarding pest control measures is unavailable in the language of the farmer and extension worker.

75-2385. Scherz, R. G. (Author address not given). **The management of accidental childhood poisoning.** *Pediatrics* 54(3): 323-324; 1974.

General factors involved in the management of accidental childhood poisoning are discussed. At least 2,000,000 such cases come to the attention of the health professions in the United States each year; children between the ages of 1 and 4 yr are particularly susceptible. Activated charcoal is often a valuable aid in the management of acute poisoning. Aspirin is the primary substance involved in accidental childhood poisoning, and the increased use of street narcotics and methadone as drugs for outpatient treatment has been accompanied by an increased threat to children. Hydrocarbon pneumonitis is a common result of the aspiration of products such as petroleum solvents, gasoline, and dry cleaning fluids. The wide use of pesticides in all areas of the country require physician familiarity with the chemicals most likely to be found in and around the home, the signs and symptoms of poisoning, and specific therapeutic measures. Plant ingestions can also produce serious human poisoning. Prevention must be exercised in the form of child-resistant packaging and education of young children.

75-2386. Fraumeni, J. F., Jr. (Epidemiol. Branch, Natl. Cancer Inst., Bethesda, MD). **Chemicals in human teratogenesis and transplacental carcinogenesis.** *Pediatrics* 53(5 pt. 2): 807-812; 1974. (56 references)

Pesticides that act in human teratogenesis and transplacental carcinogenesis are described. Antifolic agents given early in pregnancy usually result in abortion, with anomalies being reported in about 25% of fetuses surviving to term. The incidence of neurologic disease caused by organic mercury compounds is significantly higher in infants exposed in utero than in persons exposed as children or adults. In New Mexico a case of prenatal poisoning was reported when the mother ate pork contaminated with Hg from a fungicide used in the animal feed. Cases in Japan are reported of polychlorinated biphenyls passing transplacentally to a number of infants and fetuses and causing a peculiar dark brown staining of skin and mucous membranes. The babies had a higher frequency of other abnormalities, including growth retardation, early tooth eruption, spotted skull calcification, wide fontanelles, and gingival hyperplasia. Lead also passes the placental barrier and is a possible teratogen. At the turn of the century women working in lead processing industries had an increased frequency of pregnancy wastage and offspring with impaired growth and neurological damage.

75-2387. Samuels, S.; Howarth, C. (Dep. Biostatistics, Univ. Washington, Seattle, WA). **Respiratory cancer and occupational exposure to arsenicals.** *Arch. Environ. Health* 30(8): 423; 1975. (2 references)

It has been claimed that there is a dose-response relationship between an index of arsenic exposure and the ratio of observed:expected respiratory cancer deaths among Dow Company employees. This finding is subject to criticism in that the estimates of expected numbers of deaths were unreliable, both the exposed and control study groups were badly biased samples of the actual employee populations, and although the product (lead arsenate) is pentavalent, trivalent arsenic is used in the first stages of its manufacture. It is important to completely eliminate the possibility of exposure to arsenic trioxide before the pentavalent form can be properly evaluated.

75-2388. Kilham, L. (Dep. Microbiol., Dartmouth Med. Sch., Hanover, NH 03755). **Debilitated condition of warblers encountered at Parc Daniel, Gaspe Peninsula.** *Can. Field-Natur.* 88(2): 223; 1974.

On June 12, 1973, two yellow-bellied flycatchers and eight warblers representing three species were found on the ground at Parc Daniel in an extremely feeble condition. Of the numerous other species of birds and small animals in the park, none seemed to be affected. The affected birds were uninjured, did not appear to be ill, and their plumages were in good condition. The reason for the debilitated condition of these birds is unknown. While it is unlikely that a substance such as DDT or fenitrothion was involved, this possibility cannot be ruled out.

75-2389. Infante, P. F.; Newton, W. A., Jr. (Ohio Dep. Health, Columbus, OH). **Prenatal chlordane exposure and neuroblastoma.** *N. Engl. J. Med.* 293(6): 308; 1975. (3 references)

Recent observations indicate that pure chlordane is carcinogenic in laboratory animals, and heptachlor, which is usually found in technical chlordane in amounts of 7-13%, is a recognized carcinogen. A case is reported involving maternal exposure to chlordane during the first trimester of pregnancy and the subsequent development of a neuroblastoma in the right adrenal gland in the daughter at age 2 yr 8 mo. The mother's home was treated for termite infestation with 470 liters of a 1% chlordane solution. The odor was reportedly strong for 4-5 days and noticeable for 2 weeks, and there was no ventilation in the basement where the mother spent 25-30 hr per week. The association between the chlordane exposure and the neuroblastoma may be coincidental, but a transplacental carcinogenic mechanism seems possible.

75-2390. Anonymous. **FAO/WHO pesticides residue tolerances for foodgrains.** *Pesticides* 9(2): 33-34; 1975.

The FAO/WHO pesticide residue tolerances for var-

ious pesticides on foodgrains are presented. The maximum acceptable daily intake in mg/kg body wt are presented for these pesticides: bromide, carbaryl, carbon disulfide and tetrachloride, chlordane, chlorfenvinphos, 2,4-D, diazinon, 1,2-dibromoethane, 1,2-dichloroethane, dichlorvos, dieldrin, diquat, endosulfan, endrin, fenthion, heptachlor, hexachlorobenzene, hydrogen cyanide, hydrogen phosphide, malathion, methyl bromide, phosphamidon, piperonyl butoxide, and pyrethrins. The pesticides are intended to be applied at one of these stages: point of entry into a country and, in the case of cereal for milling, if product has been freely exposed to air for a period of at least 24 hr after fumigation and before sampling; to milled cereal products intended for baking or cooking; to commodity at point of retail sale or when offered for consumption.

75-2391. Jindrichova, J. (Clin. Occup. Dis., Faculty Hosp., Hradec Kralove, Czechoslovakia). **Choroby z povolani v zemedelstvi a lesnim hospodarstvi v CSSR mimo antropozoonozy.** [**Occupational diseases in agriculture and forestry in Czechoslovakia (excepting anthropozoonoses).**] *Prac. Lek.* 26(4): 134-136; 1974. (4 references) (Czech)

In the years 1957-1971 anthropozoonoses constituted 84.7% of all occupational diseases in agriculture and forestry in Czechoslovakia. The remainder was composed of skin diseases (1526 or 6.9%), vasoneurosis (1496 or 6.8%), and various poisonings (407 or 1.8%). The skin diseases, other than those contracted from the animals, were mainly due to handling of insecticides and agrochemicals, and industrial chemicals by inexperienced personnel, and allergies. Poisonings were by organic phosphates (215), cyanamides(47 injuries), organochlorine compounds (20), lead (25), carbon monoxide (15), Thomas meal (13), mercury (5), and others including acute local poisonings by inhalation (48). A majority of poisonings occurred during spraying operations and by handling of sprayed plants. Some of the poisonous chemicals are readily available to unskilled personnel, who apply them without adequate protection and training. During the time included in this survey, the total number of occupational diseases peaked in 1964 and is now generally declining, although the maximum number of skin diseases occurred in 1960.

75-2392. Zitko, V. (Dep. Environ., Biol. Stn., St. Andrews, New Brunswick, Canada). **Toxicity and pollution potential of thallium.** *Sci. Total Environ.* 4(2): 185-192; 1975. (90 references)

The toxicity of thallium to humans, plants, and animals is reviewed. Thallium and its compounds are highly toxic. In mammals thallium is slightly more acutely toxic than mercury and its toxicity is exceeded only by that of methyl mercury. Hardness of water, which strongly affects the toxicity of metals to fish, may not have much effect on the toxicity of thallium because of its low complexing ability. Hypertension is one of the symptoms of thallium poisoning in humans and may be caused by the oxidation of thallium (I) to thallium (III) which inhibits the ATPase of amine-storing granules, thus causing alteration in the catecholamine metabolism. Thallium is toxic to bacteria, but quite high levels are generally required for measurable effects. Thallium is toxic to plants and inhibits chlorophyll formation and seed germination. Thallium compounds were used as rodenticides as far back as 1920. The high toxicity of these compounds resulted in the cancellation of their use against mammalian predators in the United States. Many countries still use thallium compounds for this purpose. The rodenticidal application of thallium compounds may lead to accidental poisonings but is not likely to cause a major pollution problem and will probably be gradually discontinued.

75-2393. Tsunenari, S.; Kita, G.; Sasaki, S. (Sch. Forensic Med., Fac. Med., Kumamoto Univ., Kumamoto, Japan). [**Legal toxicological study on paraquat dichloride herbicide.**] *Nippon Hoigaku Zasshi (Jpn. J. Leg. Med.)* 28(6): 462; 1975. (Japanese)

A herbicide, Gramoxon, containing 24% paraquat dichloride, was introduced as an interesting poison from the standpoint of forensic medicine. The a.i. in aqueous solution is separated by a cation-exchange resin column such as Dowex 50W-4. Qualitative and quantitative analyses of the a.i. could be carried out by colorimetry utilizing hydrosulfite. The a.i. was observed as an orange-red spot of *Rf* 0.05-0.52, in TLC on silica gel plate using methanolic hydrochloric acid as developing solvent and Dragendorf reagent as coloring agent. Four peaks are obtained when the reduction products of the a.i. with sodium boron hydride is injected into gas chromatograph with flame ion detector packed with SE-30 (5%).

75-2394. Lopez-Ramos, F.; Marroquin-Moreno, M. (Tech. Div., Coordinated Public Health Serv., Secretariat of Health Welfare, Baja California, Mexico). **Intoxicaciones por plaguicidas en Mexicali.** [**Poisoning by pesticides in Mexicali.**] *Salud Pub. Mexico* 12(2): 199-206; 1970. (Spanish)

The Mexicali valley of Baja California has 553,320 inhabitants and an annual mortality rate of 31.1 per 100,000 in the rural areas, most of the deaths occurring in August. Although many deaths are attributed to sunstroke, pesticides are strongly suspected in many cases. On September 25, 1967, more than 500 persons experienced parathion poisoning from contaminated food, and 16 died. In 1969, 59 cases of insecticide poisoning were reported, only 17 of these being provided with a medical history. In August, 1969 an intensive public information campaign was conducted in all the media, and a regulation on the control of pesticides was issued in July 1968 by the Occupational Health Administration. Data is given on the agricultural picture of this geographical area, together with statistics on the use of pesticides, clinical data on poisoning cases, and several recommendations.

75-2395. Ishitsu, S.; Momotani, H.; Sato, M.; Nakayama, E.; Minami, M. (Sch. Public Health, Tokyo Women's Med. Coll., Tokyo, Japan). [**Methyl bromide intoxication.**] *Proc. 18th Annu. Meet. Jpn. Soc. Ind. Med.* 1975, p. 62-63. (Japanese)

Results are presented of neurophysiological and ophthalmological examinations of 22 to 62 year old workmen who engaged in the preparation of methyl bromide for 5 months to 10 years. Individual exposure time was under investigation. Most frequent subjective symptoms were various neurological abnormalities: exaggerated tendon reflex of extremities, disappearance of reflex of abdominal wall, abnormal sensations in legs, and abnormal conduction velocity. Ophthalmological disturbances included cases of convergence disturbance, incomplete convergence paralysis, regulatory disturbance, and mydriasis. The average bromine content of the workers' urine was 27.7 mg/l, about 4 times that of people not exposed to methyl bromide.

75-2396. Beitz, H. (Inst. Pflanzenschutzforsch. Kleinmachnow, Kleinmachnow, DDR). **Chemischer Pflanzenschutz und Umweltschutz unter den Bedingungen der Intensivierung der Pflanzenproduktion.** [**Chemical plant protection and protection of environment under the conditions of crop production intensification.**] *Nachrichtenbl. Pflanzenschutzdienst DDR* 29(6): 117-121; 1975. (9 references) (German)

With consideration given to the increasing use of plant protectives, fundamental requirements of environmental protection relative to agriculture are outlined. The development and substitution of new plant protectives is considered to be very important and toxicological requirements are mentioned. The estimation of late injurious effects plays a very important role in the standardization of plant protectives. Tolerance regulations of 1971 are compared with those of 1974. The active principles are rated for their toxicity and tolerance values and a system is described which may be used to classify the toxicity of plant protectives to fish.

75-2397. Paggiaro, P. L.; Martino, E.; Mariotti, S. (Ist. Med. Lavoro, Univ. Pisa, Pisa, Italy). **Su un caso di intossicazione da acido 2,4-dichlorofenossiacetico.** [**A case of 2,4-dichlorophenoxyacetic acid (2,4-D) intoxication.**] *Med. Lavoro* 65(3-4): 128-135; 1974. (23 references) (Italian)

A case of acute poisoning by inhalation of 2,4-dichlorophenoxyacetic acid (2,4-D) is described. Such symptoms as the appearance of myalgia, muscular hypertonia, fever, headache, and constipation, were preceded by the transient loss of consciousness, failing urinary control and vomiting. Intermittent nodal tachycardia was observed, which did not correspond to other reported cases. During quinidine hydrochloride administration, cardiac arrhythmia and muscular hypertonia subsided gradually. Experimental evidence suggesting an interference of 2,4-D in membrane polarization of striated muscle fibers led to a discussion of the possible causal relationship between 2,4-D poisoning and nodal tachycardia. Changes in the thyroidal uptake of radioiodine and the level of circulating thyroid hormones are produced by chronic 2,4-D poisoning in rats. Because these and other aspects of thyroid function were found to be normal in the present case, it is believed that the discrepancy may be related to different exposure times to the toxic agent.

See also 75-2468

75-2398. Villa, P.; Ghezzo, F.; Cenci, P.; Corradini, L. (Inst. Hyg., Cattol. S. Cuore, Rome, Italy). **Iodine-azide test and dithiocarbamate exposure.** *Acta Med. Rom.* 12(2): 97-107; 1974. (23 references)

The increasing use of dithiocarbamates as fungicides has raised the problem of checking exposure levels in those exposed occupationally. The preliminary results are presented of experimental studies on 17 male, 3 month old New Zealand rabbits aimed at evaluating urinary iodine-azide tests as an indirect measurement of dithiocarbamate exposure. After i.p. administration of sodium diethyl dithiocarbamate (NaDDC) (10 mg and 100 mg/kg occasionally) pre-exposure levels of sulfur urinary catabolites exhibited a significant increase. This increase lasted over a week with 100 mg/kg dosages. Urine levels of sulfur compounds reacting to iodine-azide, however, were found to vary according to the diet in the animals that had not been treated with NaDDC. Further studies are underway to precisely estimate the effect of other sulfur compounds likely to be found in urines of normal subjects, namely with respect to the effect of feeding. It may be possible to develop a highly reliable standardized method taking into consideration particularly the expected differences in dithiocarbamate metabolism.

75-2399. Hrdina, P. D.; Singhal, R. L.; Ling, G. M. (Dep. Pharmacol., Fac. Med., Univ. Ottawa, Ottawa, Ontario, Canada). **DDT and related chlorinated hydrocarbon insecticides: pharmacological basis of their toxicity in mammals.** *Adv. Pharmacol. Chemother.* 12: 31-88; 1975. (159 references)

The toxic effect of DDT and related chlorinated hydrocarbon insecticides is discussed in relation to general toxicity, central nervous system toxicity, reproductive system toxicity, and toxicity to the liver and kidney. The metabolism of DDT and related compounds is discussed with specific attention to distribution in the body, distribution within the central nervous system, correlation with neurotoxic effects, and biotransformation and excretion. The pharmacological basis of the toxic effects of these insecticides is discussed as it relates to the central nervous system, the reproductive system, the kidney, and the liver. Specific information is provided on cyclic adenosine 3′,5′-monophosphate and DDT action on the liver and kidney.

75-2400. Ishizuka, K.; Hirata, H.; Fukunaga, K. (Lab. Herbicides, Inst. Phys. and Chem. Res., Wako, Saitama, Japan). **Absorption, translocation and metabolism of 2-*tert*-butyl-4 (2,4-dichloro-5-isopropoxyphenyl) - Δ-1, 3,4-oxadiazolin - 5-one (oxadiazon) in rice plants.** *Agric. Biol. Chem. (Tokyo)* 39(7): 1431-1446; 1975. (7 references)

Of the metabolites of 2-*tert*-butyl - 4 - (2,4-dichloro - 5 - isopropoxyphenyl) -Δ-1,3,4 - oxadiazolin-5-one (oxadiazon) in rice plants one of the unidentified compounds, designated as M-1, was found at high levels in head parts as compared with the parent compound and other metabolites. Identification of M-1 was made by means of thin-layer chromatography, gas-liquid chromatography, mass spectrometry, and coincidence with the synthetic compound. M-1 was identified as 1-(2,4-dichloro - 5 - isopropoxyphenyl) - 1 - methoxycarbonyl - 2 - trimethylacetyl - hydrazine and a pathway for cleavage of the oxadiazoline ring of oxidiazon in rice plants was confirmed.

75-2401. Hirata, H.; Ishizuka, K. (Lab. Herbicide, Inst. Phys. and Chem. Res., Wako, Saitama, Japan). **Identification of the metabolite (M-1) of 2-*tert*-butyl-4-(2,4-dichloro-5-isopropoxyphenyl)-Δ-1,3,4-oxadiazolin-5- one (oxadiazon) in rice plants.** *Agric. Biol. Chem. (Tokyo)* 39(7): 1447-1454; 1975. (2 references)

Absorption, translocation and metabolism of 2-*t*-butyl-4-(2,4 - dichloro-5-isopropoxyphenyl) -Δ-1,3,4-oxadiazolin - 5 -one (oxadiazon) in rice plants were investigated. Three types of ^{14}C-labeled oxadiazon were used in this study. ^{14}C-Labeled oxadiazon was applied to soil under submerged conditions and plants were taken from the preparations at various stages of growth and development. Oxadiazon was translocated to shoots and accumulated in the lower leaves and stems. A small portion of oxadiazon taken in by plants was translocated to the head parts. Oxadiazon was chemically transformed in plants to produce dealkylated compounds, oxidized alcohol, and carboxylic acid as metabolites. In addition, two unidentified metabolites were detected, one of which was translocated to head parts from leaves and stems. Translocation and accumulation of oxadiazon and its metabolites were discussed in relation to physiological conditions of rice plants.

75-2402. Janda, J. (Res. Inst. Forestry Game Buying, Zbraslov nad Vltavou, Czechoslovakia). **O toxickem ucinku insekicidu Soldep na bazanty a zajice.** [**Toxic effect of Soldep insecticide on pheasants and rabbits.**] *Agrochemia* 15(4): 120-123; 1975. (6 references) (Slovak)

A commercial insecticide, Soldep (25% trichlorfon), exhibited the following toxic effects: for a single oral administration the LD50 was 346.7 mg/kg body weight for a mature pheasant and 710.1 mg/kg for a mature rabbit; with repeated feeding the LD50 was 3×223.9 mg/kg for pheasants. The lethal dose for all animals was 668.3 mg/kg. No toxic effects were observed with doses of less than 182 mg/kg. Contamintion with Soldep does not prevent the animals from eating the food. Doses that are likely to be consumed by small animals in their natural surroundings are harmless.

75-2403. Schnitzerling, H. J.; Nolan, J. (Div. Entomol., CSIRO Long Pocket Lab., Indooroopilly, Queensland, Australia). **A method for the determination of the concentration of catalytic centres in low activity and unstable preparations of acetylcholinesterase.** *Anal. Biochem.* 67(1): 81-90; 1975. (21 references)

A simple and rapid method has been developed for the titration of catalytic centres of acetylcholinesterase of low activity and stability in homogenates of larvae of the cattle tick *Boophilus microplus*. It is based on the difference in uptake of the labeled organophosphate inhibitor [^{14}C]coroxon between substrate-protected and unprotected enzyme. The excess coroxon is removed rapidly by solvent extraction of the acidified enzyme medium with acetone and toluene. The method was validated by the use of bovine erythrocyte acetylcholinesterase, with only 6 p*M* catalytic center mole equivalents of this enzyme being required for a single accurate assay. The turnover number at pH 7.6 and 37°C was 1.22 x 10^6 molecules of acetylcholine hydrolyzed per min per active centre. The catalytic efficiency of enzyme of larvae of the cattle tick was markedly different, being one-tenth of that of bovine erythrocyte enzyme. Advantages of the method are discussed. (Author abstract by permission of Academic Press)

75-2404. Smith, R. L. (Dep. Biochem. Exp. Pharmacol., St. Mary's Hosp. Med. Sch., London, England). **The problem of species variations.** *Ann. Nutr. Aliment.* 28(4): 335-349; 1974. (19 references)

Animal species vary in their responses to toxic chemicals. This is of importance when laboratory species are used to investigate the toxicity of chemicals to which man may be exposed. The pre-clinical safety evaluation of chemicals for use in man is usually done using mammalian species, relying on the assumption that mammals are more likely to provide suitable models than nonmammalian species. Interspecies variations in response to toxic substances originate in differences in one or more of the following factors: rate of absorption, binding to plasma proteins and other tissue macromolecules, the mode of excretion, the rate and route of metabolism, and the nature of the receptor. The overall pattern of metabolism of most organic compounds in animal species is similar but considerable variations can occur. These metabolic differences arise because of species differences in the extent of occurrence of competing metabolic reactions, defects of certain metabolic pathways in some species, and the occasional occurrence of unusual reactions. Specific differences in metabolism are considered for the rat, guinea pig, rabbit, dog, rhesus monkey, squirrel monkey, capuchin, ferret, cat, pig, fruit bat, insects, ticks, spiders, pigeon, and man.

75-2405. Davison, K. L.; Sell, J. L. (Agric. Res. Serv., Metab. Radiat. Res. Lab., Fargo, ND 58102). **DDT thins shells of eggs from mallard ducks maintained on ad libitum or controlled-feeding regimens.** *Arch. Environ. Contam. Toxicol.* 2(3): 222-232; 1974. (14 references)

Mallard ducks were fed diets containing various levels of technical DDT or chemically pure *p,p'*-DDT or dieldrin. Either technical DDT or *p,p'*-DDT at 20 ppm or greater, or dieldrin at 10 ppm caused a statistically significant reduction in eggshell thickness, weight, and calcium. Shells of eggs from ducks fed 40 ppm of *p,p'*-DDT were about 20% thinner than those from control ducks, and shells of eggs from ducks fed 10 ppm of dieldrin were about 6% thinner than those from controls. The reduction in eggshell thickness was linear with increasing dose of DDT to 40 ppm, and with increasing dose of dieldrin through all levels studied. Eggshell thinning occurred regardless of whether the diets containing DDT were fed under ad libitum or controlled conditions. DDT fed at 200 ppm was lethal to the ducks. Neither DDT nor dieldrin affected weight of the eggs or rate of egg production. (Author abstract by permission)

75-2406. Karel, A. K.; Saxena, S. C. (Toxicol. Lab., Dep. Zool., Univ. Rajasthan, Jaipur, India). **Investigation on the acute toxic effect of chlordane on the serum proteins of *Meriones hurrianae* Jerdon.** *Arch. Int. Physiol. Biochim.* 83(2): 287-292; 1975. (12 references)

The effect of chlordane on the total serum proteins was investigated in Indian adult male desert gerbils. The 60 animals were divided into 2 groups, with those in the experimental group receiving i.m. injections of 0.2 ml of 1.0% chlordane into the thigh. Autopsy was performed 1, 2, 3, 7, 14, 21, and 28 days after treatment. In additional experiments 0.2 ml of 2.0 and 3.0% chlordane was used. The results of this study indicate that chlordane administration results in hyperproteinemia in intoxicated gerbils. An initial increase in total serum proteins is followed by a decrease approaching the control values within 4 weeks. The increase in total serum proteins is more pronounced in gerbils treated with higher concentrations than in those treated with lower concentrations of chlordane. The recovery time is less for those receiving the 1.0% concentration. It is postulated that the insecticide may affect the protein metabolism by an alteration in the nutritional state of the animal. The increased serum protein level may be a result of increased incorporation of amino acids into protein or to degeneration and necrosis of parenchymal liver cells. Increased incorporation of amino acids into protein may be due itself to a rise in amino acid pool size brought about by a blockage in the conversion of amino acids to keto acids in liver cells. The recovery in total serum protein level may be attributed to the metabolism of chlordane in the body of intoxicated animals. The increased incorporation of amino acids into protein in liver and their subsequent release in the serum could be the main reason for the increased serum protein level in chlordane intoxicated gerbils.

75-2407. Akahori, F.; Masaoka, T.; Araki, K. (Dep. Vet. Pharmacol., Azabu Vet. Coll., Tokyo, Japan). [**Basic studies on toxicity assay of pesticides, I. Short term toxicity test of the carbamate insecticide BPMC (Bassa) on goats, sheep, and pigs.**] *Azabu Jika Diagaku Kenkyu Hokoku (Bull. Azabu Vet. Coll.)* 28: 135-156; 1974. (31 references) (Japanese)

The toxicity of 2-*sec* - butylphenyl - *N*-methyl car-

bamate (BPMC) on 6 goats, 7 sheep, and 5 miniature pigs was studied. Animals were given 30 or 300 mg/kg BPMC every day for 30 days and the rectal temperature, heart rate, respiratory rate, electrocardiogram, RBC, WBC, total serum protein, and microhematocrit were observed. Of animals fed 300 mg/kg 2 goats and 1 pig died before the end of 30 days, had elapsed; however, BPMC toxicity to sheep was highest and all sheep died after the first 300 mg/kg had been given. The apparent toxic effects on the animals included superficial fasciculations, respiratory difficulty, melancholic behavior, limb paralysis, and other disturbances relating to the central and autonomic nervous systems. These effects were more pronounced in earlier stages of the 30 day experiment. Both heart rate and respiratory rate increased rapidly 3 to 12 hr after BPMC administration and returned to normal within 20 to 24 hr. BPMC had little effect on blood; no abnormality was observed in surviving animals. Autopsy on the dead animals showed spot-like bleedings in heart, liver, thymus, bladder mucosa, and duodenal mucosa, and swellings in blood vessels of brain and in lymph nodes.

75-2408. Hosokawa, S.; Miyamoto, J. (Res. Dep., Pesticide Div., Sumitomo Chem. Ind. Co. Ltd., Takarazuka, Hyogo, Japan). **Effects of subchronic feeding of sumithion, sumioxon and *p*-nitrocresol on rat liver oxidative phosphorylation and mixed function oxidases.** *Bochu Kagaku (Sci. Pest Contr.)* 40(11): 33-38; 1975. (30 references)

The effects of dietary sumithion (fenitrothion, 150 ppm), sumioxon (fenitroxon, 50 ppm), and *p*-nitrocresol (500 or 1500 ppm), on the hepatic oxidative phosphorylation and mixed function oxidases of the rat were investigated following a 6-month feeding program in male and female Wistar rats. Sumioxon caused a slight decrease in the ADP:O ratios in the males, and *p*-nitrocresol at 1500 ppm caused a similar decrease in the females. Sumioxon also enhanced the activity of aniline hydroxylase in the males, although sumithion had no such effect. Neither compound produced significant changes in the respiratory control ratio, ATPase activity, aminopyrine demethylase activity, $NADPH_2$-cytochrome C reductase activity, or cytochrome P-450 content in either sex.

75-2409. Kadota, T.; Koda, H.; Miyamoto, J. (Res. Dep. Pesticide Div., Sumitomo Chem. Ind. Co. Ltd., Takarazuka, Hyogo, Japan). **Subchronic toxicity studies of sumithion, sumioxon, and *p*-nitrocresol in rats, and 92 week feeding study of sumithion with special reference to change of cholinesterase activity.** *Bochu Kagaku (Sci. Pest Contr.)* 40(11): 38-48; 1975. (19 references)

The chronic toxicity of sumithion (fenitrothion), sumioxon (fenitroxon), and *p*-nitrocresol was studied in young male and female Wistar rats, along with the effects of sumithion on the blood cholinesterase activity. The animals were maintained for 6 months on powdered diets containing sumithion (10, 30, or 150 ppm), sumioxon (5, 15, or 50 ppm), or *p*-nitrocresol (150, 500, or 1500 ppm), or were given sumithion (2.5, 5, or 10 ppm) for 92 weeks. None of the compounds tested produced significant changes in behavior, mortality, organ weight, weight gain, water and food consumption, urinalysis, or hematology. However, sumithion and sumioxon produced dose-related decreases in the activity of the plasma, red blood cell, and brain cholinesterases, the activity of the plasma and brain enzymes being more sensitive in the females than in the males. Sumioxon at 5 and 15 ppm caused no significant reductions in the plasma or red blood cell enzymes, and sumithion at 10 ppm caused no significant reduction in the red blood cell enzyme.

75-2410. Kadota, T.; Okuno, Y.; Miyamoto, J. (Res. Dep., Pestic. Div., Sumitomo Chem. Ind. Co. Ltd., Takarazuka, Hyogo, Japan). **Acute oral toxicity and delayed neurotoxicity of five organophosphorus compounds, salithion, cyanox, surecide, sumithion, and sumioxon, in adult hens.** *Bochu Kagaku (Sci. Pest Contr.)* 40(2): 49-53; 1975. (10 references)

The acute oral toxicity and delayed neurotoxicity of salithion, cyanox (cyanophos), surecide (cyanofenphos), sumithion (fenitrothion), and sumioxon (fenitroxon) were studied in white leghorn hens. The acute oral LD50 of these compounds was 110, 37.5, 60, 500, and 35 mg/kg, respectively. In the delayed neurotoxicity tests, the compounds were orally administered in doses equaling or approaching the LD50; atropine and 2-PAM were administered simultaneously to protect against acute toxicity and the birds were observed for 21 days. None of the compounds studied caused delayed neurotoxic symptoms. Similarly, no neurotoxicity was observed following the 4-week oral administration of sumithion and surecide at 1/15 and 1/30 of the acute oral LD50/day. Delayed neurotoxicity was, however, observed following the oral administration of tri-*ortho*-tolyl phosphate (TOCP, 300 and 500 mg/kg), which was employed as a positive control.

75-2411. Kadota, T.; Miyamoto, J. (Res. Dep., Pestic. Div., Sumitomo Chem. Ind. Co. Ltd., Takarazuka, Hyogo, Japan). **Acute and subacute toxicity of sumithion in Japanese quails.** *Bochu Kagaku (Sci. Pest Contr.)* 40(2): 54-58; 1975. (10 references)

The acute and subacute toxicity of sumithion (fenitrothion) were studied in Japanese quail. The acute oral LD50 of sumithion in young male and female quails was 110 and 140 mg/kg, respectively. The dietary administration of sumithion at levels as high as 50 ppm for 4 weeks had no adverse effects on behavior or body weight gain. Similarly, the rate of egg laying was not affected by the dietary intake of 15 ppm sumithion, and this parameter was only slightly affected by 50 ppm. At 150 ppm, however, egg laying was reduced by 1/3, although control levels were regained within 2 weeks after the cessation of sumithion feeding. The cholinesterase activity in the blood and brain was inhibited by doses of 15 ppm or greater, the blood enzyme being more susceptible than the brain enzyme. In

addition, enzyme inhibition in the females was more pronounced than in the males. The enzyme activity returned to normal levels within 2-4 weeks after the cessation of pesticide treatment.

75-2412. Clegg, T. J.; Koevening, J. L. (111 Court St., Newtown, PA 18940). **The effect of four chlorinated hydrocarbon pesticides and one organophosphate pesticide on ATP levels in three species of photosynthesizing freshwater algae.** *Bot. Gaz. (Chicago)* 135(4): 368-372; 1974. (21 references)

The effect of DDT, aldrin, chlordane, diazinon, and dieldrin on ATP level and population growth was investigated in three species of photosynthesizing freshwater green algae. *Chlorella ellipsoidea, Chlamydomonas sp.*, and *Euglena elastica* were exposed to concentrations of 100 ppm of the pesticides for 3 days under continuous illumination. ATP was then extracted and assayed by measuring luminescence in a luciferin-luciferase solution. All of the pesticides significantly reduced the amount of ATP detected in algal extracts. Exposure to chlordane consistently reduced ATP levels the most. In *Chlorella*, exposure to any of the pesticides reduced by half or more the amount of ATP that was detected. In *Chlamydomonas*, exposure to chlordane decreased by 50% the concentration of ATP; diazinon, aldrin, and dieldrin reduced ATP levels by 20-25%. Exposure of Euglena cultures to chlordane reduced by 40% the amount of ATP, while aldrin and dieldrin reduced it by 18%. DDT or diazinon had no significant effect on the level of ATP. In all species, the amount of ATP detected after 4 min was consistently and significantly lower in extracts from algae exposed to pesticides compared with controls. Population levels in all species were unaffected by exposure to the insecticides. It is hypothesized that the pesticides interfere with photophosphorylation in the light reaction of photosynthesis in these algae.

75-2413. Vargova, M.; Kovalcik, V. (Natl. Inst. Hyg., Bratislava, Czechoslovakia). **Nove pristupy k rieseniu toxicity latok po opakovanom podavani. [New approaches to the solution of the toxicity of substances following repeated administration.]** *Bratislav. Lek. Listy* 6(2): 182-187; 1973. (9 references) (Czech)

Some problems involved in determining the toxicity of insecticides are considered. These include the choice of animal species, intersexual differences, and the means of application used in testing. Heptachlor has been chosen as the model substance. Heptachlor's acute toxicity does not vary significantly in mice and rats. Investigations indicate that rats are more sensitive to the lethal effect of heptachlor than mice, following repeated administration. Studies on sexual differences show that heptachlor toxicity is higher in male mice and female rats than in female mice and male rats after a repeated administration. Heptachlor toxicity was also higher following peroral administration when compared to the intraperitoneal administration.

75-2414. Britton, W. M. (Dep. Poultry Sci., Univ. Georgia, Athens, GA 30602). **Influence of high levels of DDT in the diet on liver microsomal estrogen metabolism in the laying hen.** *Bull. Environ. Contam. Toxicol.* 13(6): 698-702; 1975. (13 references)

The effect of technical grade DDT on estrogen metabolism by the liver microsomes was studied using Single Comb White Leghorn laying hens. The assay procedure used involved measurement of the metabolism of estradiol-17 β-4-^{14}C. The ingestion of 500 ppm DDT in the diet for 10 days had no significant effect on estrogen metabolism, but estrogen metabolism was increased after 18 days and more than doubled after 51 days. In a second experiment, hens were fed diets containing 0, 300, 600, or 1200 ppm DDT and estrogen metabolism by the liver microsomes was examined at 0, 7, 14, 21, and 35 days. At 600 or 1200 ppm DDT, estrogen metabolism was significantly increased at 14 days, and at 300 ppm DDT, estrogen metabolism was significantly increased at 21 days. The ability to metabolize estrogen increased by a maximum factor of 2 in all DDT-fed hens; this required 14 days when the birds were fed 1200 ppm, 21 days when they were fed 600 ppm, and 35 days when they were fed 300 ppm. The DDT-induced increase in estrogen metabolism was dose and time dependent.

75-2415. Rosenkranz, H. S. (Dep. Microbiol., Coll. Physicians Surgeons, Columbia Univ., New York, NY). **Genetic activity of 1,2-dibromo-3-chloropropane, a widely-used fumigant.** *Bull. Environ. Contam. Toxicol.* 14(1): 8-12; 1975.

The mutagenicity and DNA-modifying activities of DBCP were tested in a normal *Escherichia coli* strain (*E. coli* pol A^+) and a strain deficient in DNA polymerase I (*E. coli* pol A_1^-). Agar plates were inoculated with the tester strains, filter discs impregnated with the test chemical were placed on top of the bacterial lawn, and the plates were incubated at 37°C for 9 hr; in this test, *E. coli* pol A_1^- would be preferentially inhibited by an agent which alters the cellular DNA. To test mutagenicity, the ability of DBCP to induce histidine-requiring strains of *Salmonella typhimurium* to mutate back to histidine independence was studied. DBCP preferentially blocked the growth of *E. coli* pol A_1^- and had a mutagenic effect on *S. typhimurium*. In the latter system, the fumigant was shown to induce mutations of the base-substitution but not of the frame-shift type; thus DBCP appears to act as an alkylating agent.

75-2416. Zitko, V.; Cunningham, T. D. (Dep. Environ., Biol. Station, St. Andrews, New Brunswick, Canada). **Fish toxicity of *S*-methyl fenitrothion.** *Bull. Environ. Contam. Toxicol.* 14(1): 19-24; 1975. (9 references)

The toxicity of *S*-methyl fenitrothion to fish and its persistence in water were studied. Static toxicity tests were conducted using juvenile Atlantic salmon. *S*-methyl fenitrothion and fenitrothion were dissolved in ethanol and

added to the test flasks; water samples were analyzed periodically by spectrophotometry. The *Rf* values of fenitrothion and fenitrooxon were 0.35 and 0.09, respectively. The retention time of *S*-methyl fenitrothion relative to fenitrothion was 1.19 and 1.79 on the SE-30 and OV-1 gas chromatographic columns, respectively, and the relative detector response to *S*-methyl fenitrothion on both columns was 0.09. The hydrolysis of *S*-methyl fenitrothion in tap water at pH 7 followed first order kinetics with a rate constant of 2.9×10^5/min and a half life of 400 hr. The acute toxicity of *S*-methyl fenitrothion to juvenile Atlantic salmon was approximately equal to that of fenitrothion. For both compounds, the nominal concentration below which no mortality occurred in 96 hr was 0.63 mg/liter. The concentration of *S*-methyl fenitrothion in the test solutions decreased to 81 and 35% of the nominal value after 16 and 40 hr, respectively; only 21 and 19% of the nominal concentration of fenitrothion was present after 16 and 40 hr, respectively.

75-2417. Bond, C. A.; Woodham, D. W.; Ahrens, E. H.; Medley, J. G. (Plant Protection Quarantine Prog., Environ. Quality Lab., Brownsville, TX 78520). **The cumulation and disappearance of mirex residues. II. In milk and tissues of cows fed two concentrations of the insecticide in their diet.** *Bull. Environ. Contam. Toxicol.* 14(1): 25-31; 1975. (15 references)

Mirex residues were measured in the milk of dairy cows fed known quantities of the insecticide under normal feeding conditions; fat samples and the tissues of calves receiving milk from these cows were also analyzed. For 31 weeks three dairy cows were fed a mixture of 16% protein grain treated with 0.01 or 1.00 ppm mirex in soybean oil. Daily milk samples and fat samples taken 10 days after the end of the feeding study program were analyzed by electron-capture gas chromatography. No residues exceeding 0.08 ppm were detected in any of the milk samples, although low accumulations of mirex were found in the omental fat (0.06 ppm after the 0.01 ppm diet and 1.87 ppm after the 1.00 ppm diet). Residues of 1.82 ppm were detected in the back fat, renal fat, omental fat, loin, liver, and kidney tissues of a calf given the milk from a cow fed 1.00 ppm mirex. The results indicate that mirex does not present a major problem when consumed by ruminant-type animals with the daily ration.

75-2418. De la Cruz, A. A.; Rajanna, B. (Dep. Zool., Mississippi State Univ., Mississippi State, MS 39762). **Mirex incorporation in the environment: uptake and distribution in crop seedlings.** *Bull. Environ. Contam. Toxicol.* 14(1): 38-42; 1975. (9 references)

Seeds of soybean, garden bean, and sorghum were grown for 4 weeks under greenhouse conditions in field soil or loamy sand containing 0.5, 1.0, or 5.0 ppm mirex. The plant parts and soil were then analyzed by gas-liquid chromatography for mirex residues. The final mirex concentrations in the soil were 0.3, 0.8, and 3.5 ppm and in the sand, 0.31, 0.8, and 3.4 ppm. Varying amounts of mirex were taken up by the different parts of the plants. In general, the highest residue levels were found in the roots (0.21-0.36 ppm), and all plants grown in the loamy sand accumulated higher amounts of mirex than those grown in the field soil.

75-2419. Haque, R.; Deagen, J. T. (Dep. Agric. Chem., Environ. Health Sci. Cent., Oregon State Univ., Corvallis, OR 97331). **Binding of the chlorinated hydrocarbon bis(*p*-chlorophenyl) acetic acid with the enzyme carbonic anhydrase.** *Bull. Environ. Contam. Toxicol.* 14(1): 43-46; 1975. (5 references)

Bis-*p*-chlorophenyl acetic acid (DDA) was dissolved in a known amount of D_2O, after which carbonic anhydrase from bovine erythrocytes was added to the solution. Proton magnetic resonance (pmr) spectra were recorded on a high resolution nmr spectrometer. The addition of carbonic anhydrase to a dilute solution of DDA produced line broadening in both the benzylic and the ring proton resonance peaks. The line widths of these peaks increased as the carbonic anhydrase concentration increased and with increasing time. The increasing line widths with increasing carbonic anhydrase concentration can be explained on the basis of an interaction of DDA with the enzyme, the binding of DDB to carbonic anhydrase probably being rather weak. The ring proton was probably more involved in the binding than the benzylic proton. The binding of DDA with carbonic anhydrase may play an important role in the toxicological problems associated with DDT. The results also indicate a change in the mobility of carbonic anhydrase.

75-2420. Woodham, D. W.; Bond, C. A.; Ahrens, E. H.; Medley, J. G. (USDA, APHIS, Plant Protection Quarantine Programs, Environ. Quality Lab., Brownsville, TX 78520). **The cumulation and disappearance of mirex residues. III. In eggs and tissues of hens fed two concentrations of the insecticide in the diet.** *Bull. Environ. Contam. Toxicol.* 14(1): 98-104; 1975. (13 references)

The cumulation of mirex residues in the eggs and tissues of white leghorn laying hens consuming 0.01 or 1.06 ppm mirex in the daily ration was measured. The feeding program was continued for 27 or 39 weeks. The egg and tissue samples were analyzed by electron capture gas chromatography. Significant residues appeared in the eggs within 1 week and continued to increase thereafter, reaching maximum levels of 2.03 ppm during week 28 (1.06 ppm diet). The residue levels then gradually decreased through the 37th week, when the experiment was terminated. The eggs taken from hens fed 1.06 ppm for 27 weeks then taken off the mirex diet showed a significant reduction in residue levels; eggs from the 0.01 ppm hens did not show a significant reduction 8 weeks after termination of the mirex diet. Mirex residues in the fat, breast, liver, and kidney of the hens maintained for 39 weeks on the 0.01 ppm diet averaged 0.30, 0.01, 0.01, and 0.07 ppm, respectively; these

values in the 1.06 ppm hens were 24.79, 0.31, 1.93, and 3.43 ppm, respectively. In the hens removed from the mirex diet after 27 weeks and placed on untreated feed for 12 weeks, the residue levels in the fat, breast, liver, and kidney were 0.28, 0.01, 0.01, and 0.03 ppm, respectively (0.01 ppm diet), and 15.15, 0.11, 0.49, and 2.16 ppm, respectively (1.06 ppm diet). There was no evidence of mirex metabolites in these samples.

75-2421. Majumdar, S. K.; Golia, J. K. (Dep. Biol., Lafayette Coll., Easton, PA). **Mutation test of 2,4,5-trichlorophenoxyacetic acid on *Drosophila melanogaster*.** *Can. J. Genet. Cytol.* 16(2): 465-466; 1974. (9 references)

Two-day-old Oregon-R *Drosophila melanogaster* males were fed Carolina instant *Drosophila* medium mixed with 0 (control), 250, or 1000 ppm 2,4,5-T for 15 days. The males were then mated with virgin *Basc* females in bottles containing regular food. The F1 progeny from these crosses were allowed to intermate for 24 hr, after which males and females were paired and assorted into vials. A similar procedure was followed using the mutagenic chemical ethylmethanesulfonate (EMS). Although 2,4,5-T at both dosage levels increased the number of sex-linked recessive lethals in the F2 generation, the increase in mutation rate was significant only at the 1000 ppm level. EMS (250 ppm) produced a much greater frequency of X-linked recessive lethals than did 2,4,5-T at either dosage level.

75-2422. Suzuki, Y.; Kikuchi, H.; Uchiyama, M. (Pharm. Inst., Tohoku Univ., Aobayama, Sendai, Japan). **The release of β-glucuronidase from rat liver by the administration of diazinon, the organophosphorus insecticide.** *Chem. Pharm. Bull.* 23(4): 886-890; 1975. (18 references)

The origin of β-glucuronidase increases in serum and the mode of change of the activity in the original site was studied by injecting organophosphorus insecticides into female Wistar rats. β-Glucuronidase activity in rat serum was considerably elevated by a single injection of the insecticide, diazinon. In order to elucidate the mechanism for this increase, the intracellular distribution of β-glucuronidase in the liver was investigated. The extent of increase of β-glucuronidase in serum of diazinon treated rats correlated with the degree of decrease in microsomal fraction of the liver. After diazinon administration, the β-glucuronidase in the microsomal fraction was held constant at low levels for 10 days and a period over 30 days was required to recover the normal level.

75-2423. Wennerberg, R.; Loefroth, G. (Radiobiol. Dep., Univ. Stockholm, Wallenberg Lab., Stockholm, Sweden). **Formation of 7-methylguanine by dichlorvos in bacteria and mice.** *Chem.-Biol. Interactions* 8(5): 339-348; 1974. (45 references)

The methylating capability of dichlorvos, as assayed by the formation of labeled 7-methylguanine from radiolabeled dichlorvos, was studied in an *Escherichia coli* test system and in male NMRI mice. *E. coli* strain B was incubated for 4 hr in suspension culture with labeled dichlorvos, and the mice were given dichlorvos by i.p. injection (0.5-1 ml) or by inhalation exposure for 2 hr. Hydrolyzed DNA and RNA samples from the *E. coli* cultures and the purine fractions isolated from the mouse urine were analyzed by ion-exchange chromatography. Labeled 7-methylguanine was present in both the DNA and RNA isolated from the *E. coli* exposed to dichlorvos. Similarly, mice exposed to dichlorvos by either i.p. injection or inhalation excreted labeled 7-methylguanine in the urine; the labeled compound most likely originated from the nonenzymatic methylation of guanine moieties. The results indicate that the methylating capability of dichlorvos is 10- or 100-fold less than that of strongly genotoxic methylating compounds.

75-2424. De Los Reyes, M. L. (Auburn Univ., Auburn, AL). **Ultrastructural analysis of pathogenesis induced by DDT in chickens.** *Diss. Abstr. Int.* 34(7): 3329B; 1974.

Chickens were given an oral LD50 dose of DDT at 100 mg/kg body weight three times a day for 10 days. The animals were killed after morbid signs appeared. Samples of various tissues were taken for analysis of residues and electron microscopic examination. Fat and sciatic nerve tissues contained the largest amounts of DDT and metabolites, and skeletal muscle and brain contained the smallest amounts. Moderate residue levels were present in liver, pancreas, and myocardium. The liver cell underwent more changes than any other tissue studied. There were alterations in individual parenchymal cells as well as areas of tissue disorganization. Proliferation of bile duct epithelia and smooth endoplasmic reticulum was noticeable. Changes in pancreatic and cardiac tissue were less extensive. In the pancreatic tissue disorganization of the endoplasmic reticulum and a decrease of zymogen granules were noticeable, indicating the possibility of decreased production of digestive enzymes. Changes in skeletal muscle were slight, and included displacement of sarcotubules and banding pattern. The brain tissue examined appeared very similar to that of controls. Alterations of the myelin sheath, increased numbers of vesicles, and absence in some areas of the nucleated sheath of Schwann were the major changes observed in the sciatic nerve. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 74-118.)

75-2425. Watanabe, P. G. (Utah State Univ., Logan, UT). **Organophosphate neurotoxicity: study on the effects of tri-*o*-tolyl phosphate (TOTP) in the chicken.** *Diss. Abstr. Int.* 34(12): 6140B-6141B; 1974.

The time related distribution and metabolism of ^{32}P labeled TOTP (tri-*o*-cresyl phosphate, TOCP) was studied in chickens over a 2 week period. The radioactivity was measured by liquid scintillation techniques in liver, kidney, plasma, muscle, brain, and spinal cord after an oral dose of 1.25 g TOT^{32}P (243 μCi). The concentration of

labeled compounds in liver and kidney increased through 72 hours showing the highest levels of all tissues (502.0 and 480.0 μg/g tissue, respectively) and then declined. Nervous tissue (brain and spinal cord) levels increased throughout the 2 week period indicating 50-60 μg/g tissue on the fourteenth day. All other tissues showed an increase over the first few days then a decline. The relative distribution of the radioactivity in terms of TOTP and its metabolites was followed at different time intervals up to 72 hours in liver and 24 hours in plasma. A fraction of the administered TOTP appeared to be excreted unabsorbed during the first 24 hours. The total rate of excretion increased during the first 12 hours and then declined. Only 26.5% of the administered dose was recovered after 3 days. The results indicated that TOTP is slowly metabolized and excreted; the compound and its metabolites are retained in the visceral organs for several days after a single oral dose. Indices of immunologic response elicited by TOTP in chickens were investigated. An increase was noted in γ-globulin/albumin ratios of the treated group. Studies on the involvement of autoimmunity in the pathogenesis of the TOTP induced neurotoxicity in chickens were also conducted. The present investigation was unable to demonstrate primary involvement of an autoimmune nature in the neurotoxicity produced by TOTP in the chickens. A mixed cell nerve tissue culture system from dorsal root ganglia of chick embryos was used to test the effects of TOTP, its metabolites, and diisopropylphosphorofluoridate (DFP). Cytotoxic responses consisted of reduction in number and length of nerve fibers and increased vacuolization of neuroglial cells. Unmetabolized TOTP was shown to produce degenerative changes in both nerve fibers and neuroglial cells. Metabolized TOTP and DFP were slightly more potent than TOTP itself. The nerve fibers were generally more sensitive to all treatments than the neuroglial cells. A well defined, sensitive, tissue culture system was shown to yield results after only 3-5 days of culture. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 74-13,272)

75-2426. Bidwell, K.; Weber, E.; Nienhold, I.; Connor, T.; Legator, M. S. (Roger Williams Gen. Hosp., Brown Univ., Providence, RI 02908). **Comprehensive evaluation for mutagenic activity of dieldrin.** *Environ. Mutagen Soc.*, 6th Annu. Meet. Program, 1975, p. 32.

The mutagenic potential of dieldrin was investigated through direct bacterial tests with and without microsomal activation, host-mediated assay, blood and urine analysis for active metabolites, micronuclei test, metaphase analysis, dominant lethal test, and heritable translocation test. Three concentrations of dieldrin, 0.08, 0.8, and 8 mg/kg, were administered by gavage on a sub-acute basis. Since dieldrin was formulated in corn oil, the negative control was corn oil administered by gavage in dosage and schedule equivalent to the test compound. The positive control was 0.5 mg/kg of TEM in saline, injected i.p. 24 hr before sacrifice for cytogenetic tests and administered by gavage once per day for 5 days before mating for the dominant lethal and heritable translocation tests. Overall evaluation of the data from mice indicates that dieldrin is negative in all four animal tests. The Salmonella tester strains used in all bacterial tests include excision repair deficient mutants, partial and total lipopolysaccharide deficient mutants, and both frameshift and base analogue detection strains. No increase in number of mutants was found in any of the five bacterial tests.

75-2427. Grant, D. L.; Iverson, F.; Hatina, G. V.; Villeneuve, D. C. (Food Res. Lab., Health Prot. Branch, Natl. Health Welf., Ottawa, Ontario, Canada). **Effects of hexachlorobenzene on liver porphyrin levels and microsomal enzymes in the rat.** *Environ. Physiol. Biochem.* 4(4): 159-165; 1974. (31 references)

The effects of long term administration of hexachlorobenzene on liver porphyrin levels and microsomal enzymes were investigated in male and female Sprague Dawley rats. The rats were fed diets containing hexachlorobenzene at concentrations of 0, 10, 20, 40, 80, or 160 ppm for 9 and 10 months. No neurological effects were observed in any of the rats. The UDPG-glucuronyl transferase activities were unchanged in all of the treatment groups. The serum clinical enzymes were little affected by treatment, as only GPT (activities doubled) and CPK (activities halved) in the 160 ppm group were affected. The residues of hexachlorobenzene in serum and liver were very similar for males and females and were dose related. The liver:body weight ratios were increased in both sexes fed the 80 and 160 ppm diets. Weight gains of the females fed dietary levels of 80 and 160 ppm hexachlorobenzene were reduced. In vitro hepatic aniline hydroxylase and *N*-demethylase activities and cytochrome P-450 levels were increased in males fed 40 ppm or more hexachlorobenzene, but were unaltered in the females at all dietary levels of hexachlorobenzene. The pharmacological actions of pentobarbital and zoxazolamine were shortened in male and female rats fed 20 ppm or more hexachlorobenzene. Female rats acquired chemical porphyria readily whereas male rats were resistant.

75-2428. Craig, G. R.; Ogilvie, D. M. (Biol. Sect., Min. Environ., Rexdale, Ontario, Canada). **Alteration of T-maze performance in mice exposed to DDT during pregnancy and lactation.** *Environ. Physiol. Biochem.* 4(5): 189-199; 1974. (27 references)

T-maze performance was studied in male and female CF_1 mice born to and/or nursed by females fed a diet containing a sublethal amount of DDT (200 μg/g food fed throughout gestation and/or lactation). The mice exposed to DDT during both gestation and lactation suffered learning impairment; they made significantly more errors than non-DDT controls during the first series of maze trials. In addition, mice exposed to DDT during gestation and lactation took significantly longer to run the maze than controls

when retested 1 mo after the first series of trials, indicating impaired memory. The DDT mice also made significantly more errors at retest than the controls. In contrast, there was evidence for an enhancement of maze performance in the mice exposed to DDT during only gestation or lactation. None of the mothers fed the DDT diet showed apparent ill effects, but many of the young born to and/or nursed by these females exhibited typical DDT tremors, particularly at weaning, and many of them died.

75-2429. Lundberg, C. (Inst. Zoophysiol., Uppsala, Sweden). **Effects of DDT on cytochrome P-450 and oestrogen-dependent functions in mice.** *Environ. Physiol. Biochem.* 4(5): 200-204; 1974. (12 references)

The effects of *p,p'*-DDT (0.05 mg/day orally for 28 days) on the hepatic cytochrome P-450 contents and on the glycogen contents of the uterus were studied in intact and ovariectomized estrogen-treated sexually mature female NMRI mice. The frequencies of implanted ova in the uterus were also studied under the same experimental conditions. The hepatic cytochrome P-450 levels were significantly higher in the DDT-treated animals than in their respective controls. The uterine glycogen contents were significantly lower in the ovariectomized estrogen-treated mice given DDT than in the corresponding control group, whereas no difference was observed when the intact DDT-treated animals were compared with the intact controls. The frequency of implanted ova was significantly lower in the DDT-treated mice than in the controls.

75-2430. Gupta, P. K.; Khar, U.; Bawa, S. R. (Dep. Biophys., Panjab Univ., Chandigarh, India). **Effect of malathion and radiation separately and jointly upon rat enzymes in vivo.** *Environ. Physiol. Biochem.* 5(1): 49-53; 1975. (11 references)

The effect of malathion (50 mg/kg, i.p.) and/or radiation (900 R) on the activity of succinic dehydrogenase and the phosphatases was studied in vivo in female albino rats. When given separately, malathion and radiation appeared to have no effect on the acid and alkaline phosphatases of the kidney, heart, or brain. However, malathion caused a significant decrease in the brain and kidney phosphatases of pre-irradiated rats; the decreases were noted after as little as 2 hr and persisted up to 24 hr. While malathion alone had no significant effect on the activity of succinic dehydrogenase, radiation alone significantly increased the activity of this enzyme in the brain and kidney. The radiation effect appeared to be somewhat enhanced by subsequent treatment with malathion. The results suggest that the simple nonspecific stress caused by malathion may add to a similar effect of radiation by reducing the tissue phosphatase levels and enhancing the activity of succinic dehydrogenase.

75-2431. Kihlstrom, J. E.; Lundberg, C.; Orberg, J.; Danielsson, P. O.; Sydhoff, J. (Inst. Zoophysiol., Uppsala, Sweden). **Sexual functions of mice neonatally exposed to DDT or PCB.** *Environ. Physiol. Biochem.* 5(1): 54-57; 1975. (18 references)

To study the effect of exposure during the critical period of early postnatal life, the reproductive capacity was studied in NMRI mice nursed by mothers given DDT or PCB (50 mg/kg once weekly for 4 weeks beginning on the day of parturition). The reproductive capacity of the offspring was determined according to the frequency of implanted ova in the uterus. When both the male and female of a mating pair had been nursed by DDT or PCB-treated mothers, the frequency of implantation decreased from a control level of 94% to 79% and 75%, respectively. No significant decreases were found when only one of the animals in a mating pair had been nursed by a DDT or PCB-treated mother. DDT and PCB, even in low doses, may be able to disturb the normal sexual development by increasing the catabolism of steroids while young are being suckled with milk containing PCB or DDT.

75-2432. Walker, C. H.; Craven, A. C. C.; Kurukgy, M. (Dep. Physiol. Biochem., Reading Univ., Reading, England). **The metabolism of organochlorine compounds by microsomal enzymes of the shag (*Phalacrocorax aristotelis*).** *Environ. Physiol. Biochem.* 5(1): 58-64; 1975. (13 references)

The activities of the microsomal enzymes of adult male shags (*Phalacrocorax aristotelis*) towards the organochlorine substrates HHDN, HCE, and HEOM were compared with those of the microsomal enzymes of the adult male Wistar rat. The liver and kidney homogenates from the shags showed similar epoxide hydrase activity, but the rat liver preparation was much more active in this respect than the kidney preparation. The liver microsomes of the shag showed $< 8\%$ of the epoxide hydrase activity and $< 14\%$ of the hydroxylating capacity of the rat liver microsomes. The relatively low activity of these enzymes in the shag is probably the primary reason why this species has been found to contain relatively high levels of dieldrin in ecological studies.

75-2433. Kohli, K. K.; Bhatia, S. C.; Venkitasubramanian, T. A. (Dep. Biochem., Vallabhbhai Patel Chest Inst., Univ. Delhi, India). **Effect of dieldrin toxicity on acetate and palmitate metabolism in rat liver.** *Environ. Physiol. Biochem.* 5(2): 119-125; 1975. (40 references)

The effect of a single oral dose of dieldrin (30 mg/kg) on lipid metabolism was studied in male Wistar rats. The animals were fasted following the dieldrin injection and 3 hr before sacrifice were injected with acetate-1-^{14}C. The total liver lipids were measured gravimetrically, and the phospholipid phosphorus, cholesterol, total fatty acids, and glyceride glycerol in the total lipid extract were measured. Fatty acid oxidation was also studied in vitro in liver slices from dieldrin-treated animals. In the in vivo experiment, dieldrin increased the total liver lipid content, the increase being observed primarily in the triglyceride frac-

tion. The incorporation of acetate-^{14}C into fatty acids was decreased, indicating an inhibition of lipogenesis. Fatty acid oxidation was increased, and palmitate-^{14}C incorporation into the triglyceride fraction was enhanced; this indicates an overall increased utilization of fatty acids. The results indicate that the availability of large amounts of fatty acids due to enhanced mobilization from adipose tissue and a greater availability of α-glycerol phosphate are the primary factors responsible for fatty livers in dieldrin-treated animals.

75-2434. Hopff, W. H.; Waser, P. G. (Pharmakol. Inst., Univ. Zurich, Switzerland). **Acetylcholinesterase therapy in organophosphate poisoning?** *Experientia* 31(6): 729; 1975.

Anticholinesterase organophosphates bind covalently to the esteratic site of cholinesterases. Thus the hydrolysis of acetylcholine (ACh) is no longer catalyzed, and ACh accumulates in the organism. Our aim was to show a beneficial effect of acetylcholinesterase (AChE) applied i.v. in male white rats (SIV 50) 1 minute after sarin (SA) poisoning. In control rats excitation signs began 1-3 minutes after SA, followed by death in 3-7 minutes. AChE was prepared according to Hopff et al.; 1 ml of solution contained 52,000 μM units per 3 mg of protein. After ether anesthesia the rats were given 2 x LD50 of SA i.p., followed by i.v. injection of 1.5 mg (6 rats) and 3 mg (6 rats) of AChE. A matched control group of 12 rats remained untreated. A decrease in mortality rate was not observed and the symptoms of SA poisoning were not alleviated. Since AChE cannot escape from blood vessels, it can only catalyze the hydrolysis of accumulated intravasal ACh. The increased ACh content in synapses, which is responsible for the acute death, cannot be influenced. (Author abstract by permission)

75-2435. Junod, U. B.; Hopff, W. H.; Waser, P. G. (Pharmakol. Inst. Univ., Zurich, Switerland). **Problems in oxime therapy.** *Experientia* 31(6): 730; 1975.

Severe organophosphorus poisoning is still an unsolved problem in therapy and generally oximes are recommended to reactivate the inhibited cholinesterases. Our aim was to show a beneficial effect against sarin (SA) and soman (SO) poisoning. For each test 10 C.R. male mice (22-24 g) were pretreated with obidoxime (O) and atropine (A), alone and in combination, and those mice serving as controls with saline. Three minutes later the animals were treated with 2 x LD50 of SA or SO. Experiments were conducted as follows: each mouse treated with drugs was followed by a mouse treated with saline. The SA and SO solutions were prepared every 10 minutes. Doses were optimized as follows: O dosage constant, A dosage variable and vice versa. Neither O (48 mg/kg) nor A (32 mg/kg) alone showed any effect on the mortality rate. In combination O (48 mg/kg) and A (8 mg/kg) protected all mice against SA poisoning; however, SO poisoning could not be influenced. (Author abstract by permission)

75-2436. Popinigis, J. (Dep. Biochem., Med. Sch., Gdansk, Poland). **The problem of permeability barrier in mitochondrial respiration: dual effect of protamine on succinate (rotenone) oxidation.** *FEBS (Fed. Eur. Biochem. Soc.) Lett.* 41(1): 46-49; 1974. (22 references)

The effect of protamine on succinate (rotenone) oxidation in rat liver mitochondria was studied. The response of mitochondrial respiration to protamine sulfate was dependent on the composition of the incubation medium. In isoosmotic medium, protamine inhibited the rate of state 4 mitochondrial succinate (rotenone) oxidation and prevented ADP-induced transition to state 3 in both oxygen and proton uptake; this inhibition could be reversed by the addition of polyadenylate. The rate of succinate (rotenone) oxidation was significantly increased in media containing 0.5 *M* sucrose, phosphate, and citrate, stimulation being obseved when the proton ejection phase was completed. When this medium was supplemented with halothane, protamine again inhibited mitochondrial respiration; dinitrophenol plus ADP, benzene 1,2,3-tricarboxylate, atractyloside, and polyadenylate also inhibited protamine-induced succinate (rotenone) oxidation in medium containing sucrose, phosphate, and citrate. These results suggest that the rate of mitochondrial respiration may be partially controlled by permeability of the membrane to anions.

75-2437. Spyker, J. M. (Univ. Virginia Med. Sch., Dep. Anat., Charlottesville, VA 22901). **Assessing the impact of low level chemicals on development: behavioral and latent effects.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 34(9): 1835-1843; 1975.

There is growing evidence that nervous tissue, especially the brain, is more sensitive to many foreign chemical substances than has previously been suspected, and that toxic effects may be manifested as subtle disturbances of behavior long before any classical symptoms of poisoning become apparent. Early detection of an insidious toxic process (behavioral toxicology) may enable the prevention or attenuation of harm to humans and other organisms. Adding to both the sensitivity and complexity of behavioral toxicologic testing is the increasing evidence that individuals are more vulnerable to adverse factors during the period of development (conception - puberty) than at any other time in life. Subtle functional disturbances in organisms exposed while immature (behavioral teratology) may be one of the most sensitive indicators of chemical toxicity. Furthermore, defects in a developmental process may have only delayed effects. A morphological or biochemical lesion can be dormant and not manifest itself until later in life as a behavioral disorder, mental deficiency, or overt functional impairment. Longitudinal evaluation is required to detect long-term or delayed effects of a particular developmental influence on biological and behavioral functions. Examples from research on the subtle and latent consequences of prenatal and early postnatal exposure to methylmercury that illustrate the above principles are presented. It is concluded that behavioral and

long-term evaluation of organisms exposed during development are essential for a thorough assessment of the impact of certain low level chemicals on human health. (Author abstract by permission)

75-2438. Vargova, M.; Kovalcik, V.; Rosival, L.; Kapeller, K. (Nat. Inst. Hyg., Bratislava, Czechoslovakia). **Kotazke toxikologichenho hodnotenia chlorovanych insekticidov.** [**Toxicologic characteristics of organochlorine insecticides.**] *Folia Fac. Med. Univ. Comenianae* 12(1): 5-53; 1974. (101 references) (Czech)

The median lethal time (LT50) was used as the criterion for examining the toxicity of various organochlorine insecticides following a discussion of the usefulness of this criterion. The LT50 for heptachlor was a linear function of dosage, with a slope of 0.8549. The toxicity of heptachlor was enhanced by repeated administration of small doses rather than a single high dose. Heptachlor was more toxic by peroral administration than via the intraperitoneal route. Heptachlor was more toxic in rats than in mice following repeated administration, whereas the acute toxicity, expressed by the LD50, was higher in mice than in rats. Heptachlor was more toxic to female rats than to males, whereas males were the more susceptible gender of mice. Heptachlor was determined to be an effective microsomal liver enzyme inducer via the criteria of aminopyrine acute toxicity and pentobarbital sleeping time.

75-2439. Dvorak, M.; Halacka, K. (Inst. Histol. Embryol., J. E. Purkyne Univ., Brno, Czechoslovakia). **Ultrastructure of liver cells in pig at normal conditions and after administration of small doses of heptachlorine.** *Folia Morphol. (Warsaw)* 23(1): 71-76; 1975. (3 references)

The ultrastructure of liver cells in pig (*Sus scrofum* domest.) during protracted administration of heptachlor in small doses and the possible submicroscopic changes taking place during the experiment were investigated. Changes in the ultrastructure were observed 78 days after administration of 2 mg heptachlor. There was a depletion in the glycogen content in the majority of liver cells in the lobule and the agranular endoplasmic reticulum was very conspicuous in the cytoplasm. After a dose of 5 mg heptachlor changes in the ultrastructure occurred more frequently than after the 2 mg dose. On the 27th day, glycogen was found less frequently and the agranular endoplasmic reticulum was conspicuous. On the 55th day, the changes were more striking; the cisternae of the granular endoplasmic reticulum were very wide and lysosomes were present in large numbers. On the 78th day a large amount of agranular endoplasmic reticulum was observed and glycogen was present in small amount. The cisternae of the granular endoplasmic reticulum were often widened. The results indicate that it is necessary to consider the harmful effects of administration of heptachlor or other chlorinated carbonhydrates to organisms.

75-2440. Araki, Y. (Dep. Pharmacol., Fac. Med., Kyushu Univ., Fukuoka, Japan). [**Comparison of enzyme-inducing activities of chlorinated dibenzofuran and chlorinated dibenzodioxin.**] *Fukuoka Igaku Zasshi (Fukuoka Med. J.)* 65(1): 61-64; 1974. (16 references) (Japanese)

The hepatic enzyme inducing activity of chlorinated dibenzofuran (CDF) and chlorinated dibenzodioxin (CDD) was studied using a group of 10 female CF-1 mice. The effect of these pesticides was determined by the reduction in hexobarbital sleeping time. The pesticides were suspended in water with 0.5% carboxymethylcellulose and given orally to the mice at 0.1, 1, and 10 mg/kg; 100 mg/kg of hexobarbital-Na was used as an anesthetic. Both CDF and particularly CDD were highly active in reducing the sleeping time and their effects were persistent. The peak reduction in the sleeping time, 64%, occurred after 7 days of CDF at the 10 mg/kg dosage, while it occurred after 2 days (50%) at the CDF 0.1 mg/kg and 1 mg/kg dosages. Complete recovery from the pesticide effect took 14 days. The sleeping time of mice fed CDD at 1 mg/kg decreased to 49%, 40%, and 72% after 2, 7, and 14 days respectively, and complete recovery took 21 days. The amount of compound necessary to reduce the sleeping time to 60% of the control level RD 60 value was 0.3 and 0.4 mg/kg for CDF and CDD respectively. Judging from the RD60, CDF was 170 times and CDD was 1250 times more effective than PCB.

75-2441. Araki, Y.; Tanaka, K. (Dep. Pharmacol., Fac. Med., Kyushu Univ., Fukuoka, Japan). [**Potentiation of enzyme-inducing activity of PCB by DDT or BHC.**] *Fukuoka Igakkai Zasshi (Fukuoka Med. J.)* 65(1); 65-68; 1974. (18 references) (Japanese)

The hepatic enzyme activity induced by the combined administration of PCB with DDT or β-BHC is studied using a group of 10 mice. The effectiveness of these pesticides on the hepatic enzyme inducing activity was determined by the reduction in hexobarbital sleeping time. The effect of a single pesticide dose on the mouse hepatic enzyme inducing activity was also studied. The pesticide, suspended in water with 0.5% carboxymethylcellulose, was given orally to the mice, and 100 mg/kg of hexobarbital-Na was used as an anesthetic. In the combination pesticide experiments amounts ranged from 1/1 to 1/8 of the minimum effective dose of each pesticide, which was determined to be 100, 200, and 20 mg/kg for β-BHC, DDT, and PCB respectively. The potentiation was clearly observed in reduction of hexobarbital sleeping time even if less than the minimum effective dose was given. When both PCB 20 mg/kg and DDT 200 mg/kg were given to the mice, the sleeping time decreased to 44 after 2 days of the pesticide dosage: a larger reduction than the single dose of PCB 50 mg/kg or DDT 350 mg/kg achieved. The combined PCB and DDT dosage reduced sleeping time 63% and 89% after 7 days and 14 days respectively, and complete recovery from the pesticide effect was observed after 21 days of the dosage. The required time for the complete recovery from the combined dose of PCB 5 mg/kg and DDT 50 mg/kg

was 14 days. When PCB 5 mg/kg and β-BHC 25 mg/kg was given, the sleeping time decreased 65 70, and 92% after 2, 7, and 14 days respectively. This effect was comparable to that induced by the single dose of PCB 50 mg/kg, and was stronger than that of the single dose of BHC 200 mg/kg.

75-2442. Garretto, M.; Khan, M. A. Q. (Dep. Biol. Sci., Univ. Illinois Chicago Circle, Chicago, IL 60680). **Hydroxylation and epoxidation of chlordene by the mixed-function oxidase of the tropical and cold fresh water fish.** *Gen. Pharmacol.* 6(2-3): 91-96; 1975. (15 references)

The temperature and pH optima for maximum hepatic mixed-function oxidase activity in the epoxidation and hydroxylation of chlordene by adult bluegill (*Lepomis macrochirus*) and kissing gourami (*Helostoma sp.*) were studied. The temperature optimum for both hydroxylation and epoxidation was 26°C in the cold water bluegill and 37°C in the tropical gourami. The pH optima were 7.6 in the gourami and 7.4 in the bluegill and the lake trout (*Salvelinus fontinalis*). The mixed-function oxidase of the bluegill was 4-fold more active in hydroxylating chlordene than in epoxidizing it. The mixed-function oxidase system in the gourami and lake trout showed low rates of both hydroxylation and epoxidation, the rates being similar to the rate of epoxidation in the bluegill. The kissing gourami also produced a third metabolite, 1-hydroxyl -2,3-epoxychlordene. The time-course sequence of these reactions was hydroxylation, epoxidation, epoxide-hydroxide formation, indicating that different sites of enzyme activity may be involved in them.

75-2443. Franco, L.; Municio, A. M. (Dep. Bioquim., Fac. Cienc., Univ. Complutense, Madrid, Spain). **Comparative metabolism of 3-amino-1,2,4-triazole.** *Gen. Pharmacol.* 6(2-3): 163-169; 1975. (30 references)

The metabolism of the herbicide amitrole (3-amino-1,2,4-triazole) by adult male Wistar rats was studied and the metabolites formed compared with those formed by bean plants (*Phaseolus vulgaris*) and *Escherichia coli*. After 8 days of treatment with amitrole, unaltered herbicide and three metabolites were found in the urine of the rats. All three metabolites were also formed by the bean plants and two of them were formed by the *E. coli*. One of the metabolites shared by all three was isolated and recrystallized and its structure investigated. Its infrared spectrum as well as its acid-base behavior were compatible with the structure of amitrolylalanine proposed by Massini in 1963.

75-2444. Schmidt, D. C.; Weber, L. J. (Dep. Fisheries Wildlife, Oregon State Univ., Corvallis, OR 97331). **The effect of surgical impairment of biliary excretion on the toxicity of rotenone to rainbow trout and rats.** *Gen. Pharmacol.* 6(2-3): 229-233; 1975. (18 references)

The effects of bile- and cystic-duct ligation on the toxicity of rotenone in rainbow trout (*Salmo gairdneri*) and Wistar rats was studied. Rotenone was administered i.p. to the rats and either i.p. or i.v. to the fish 24 hr after surgery. Surgical impairment of biliary excretion had no significant effects on rotenone toxicity in the fish or male rats, although it did significantly decrease rotenone toxicity in the female rats. I.p. administration of rotenone produced similar toxic effects at approximately the same dose levels in both rats and fish. The LD50 of rotenone was significantly higher in male trout with mature gonads than in males with undeveloped gonads, and the toxicity of the pesticide in the trout was 10-fold greater after i.v. administration than after i.p. administration. Thus, differences in the route of entry may be primarily responsible for the selective toxicity of rotenone in fish.

75-2445. Agnihotri, V. P. (Indian Inst. Sugarcane Res., Lucknow, India). **Thiram induced changes in soil microflora, their physiological activity and control of damping-off in chillies (*Capsicum annum*).** *Indian J. Exp. Biol.* 12(1): 85-88; 1974. (22 references)

Treatment of garden soil with thiram (65% tetramethyl-thiuram disulfide) at 375, 187.5, and 93.7 ppm active ingredient had an appreciable disruptive effect on the soil microbes, particularly the fungi and actinomycetes. The spore-forming bacteria increased in number by the seventh day after treatment, then gradually decreased until by the thirty-fifth day there were no significant differences between the treated and control soils. The addition of thiram to the soils also affected the physiological activity of the soil microbes. The fungicide impaired the process of nitrification but had no effect on ammonification. The amount of available phosphorus in the soils also increased following fungicide application. Both the soil application of thiram at all three dose levels and seed treatment at 0.1% effectively controlled the damping off of chillies (*Capsicum annum*) caused by *Pythium irregulare*. Soil treatment was more effective in this respect than seed treatment. The seedlings grown in thiram-treated soil (93.7 ppm) were healthy and developed lush green foliage with profuse root systems.

75-2446. Dinamarca, M. L.; Ramirez, A.; Ballester, E.; Del Villar, E.; Capdevila, J.; Maccioni, R. (Dept. Biochem., Fac. Med., Univ. Chile, Santiago, Chile). **DDT-Dehydrochlorinase IV. — Further evidence on the lipoprotein nature of the enzyme.** *Int. J. Biochem.* 6(6): 405-412; 1975. (27 references)

The phospholipoprotein nature of DDT-dehydrochlorinase (DDTase) purified from a DDT-resistant strain of houseflies was made evident by isolation of the phospholipids by extraction of the enzyme with organic solvents and by gel filtration on Sephadex LH-20. Phosphorus analysis gave about 40 μmoles P per μmole of enzyme. Eighteen percent of this was directly extractable using organic solvents. The remaining 82% was extracted only after acid digestion of the protein, suggesting firmly bound phospholipid-protein residues. Phosphatidyl-

choline, phosphatidylserine and their lysoderivatives have been found in both DDTase extracted fractions. Fatty acids with carbon from C-12 to C-20 were identified by gas-liquid chromatography. About two-thirds corresponded to saturated fatty acids, with palmitic and stearic acids predominating. Among the unsaturated fatty acids, oleic and palmitoleic acids occurred at high levels. It is suggested that the affinity of the enzyme for phospholipid may be important in localizing the enzyme in vivo at certain critical sites in order to contribute to physiological resistance mechanisms which depend primarily on detoxication. Housefly brain is very rich in DDT-dehydrochlorinase and the high content of lipids in nerve tissue may facilitate the action of this enzyme, confirming that local detoxication is an important factor in resistance.

75-2447. Hetnarski, B.; O'Brien, R. D. (Sect. Neurobiol. and Behavior, Cornell Univ., Ithaca, NY 14850). **Electron-donor and affinity constants and their application to the inhibition of acetylcholinesterase by carbamates.** *J. Agric. Food Chem.* 23(4): 709-713; 1975. (18 references)

Twenty-three methylcarbamates were studied, and the effects of variations in their hydrophobicity and ability to form charge-transfer complexes upon their affinity, reactivity, and overall potency for acetylcholinesterase were explored. Variations in these factors accounted for most of the variation in enzymic effects, but the compounds fell into two distinct classes with respect to the relation between, for instance, reactivity and affinity. (Author abstract reprinted by permission of the American Chemical Society)

75-2448. Terriere, L. C.; Burnard, R. J. (Dep. Agric. Chem., Oregon State Univ., Corvallis, OR 97331). **Uptake, tissue distribution, and clearance of the selective piscicide 1,1-methylenedi-2-naphthol (Squoxin) by the rainbow trout and the squawfish.** *J. Agric. Food Chem.* 23(4): 714-717; 1975. (6 references)

Rainbow trout and squawfish were exposed to the selective piscicide Squoxin (1,1'-methylenedi -2-naphthol) in the laboratory, using the tritiated compound, and in the field using a commercial formulation. Laboratory exposures were at concentrations of 50 ppb, the exposures repeated as many as four times in the case of the trout. Radioassays of whole body and certain tissues and organs of the trout immediately after exposure and after fresh water purges up to 8 days showed that there was no tendency for the piscicide to be retained. Maximum residues, based on the radioassays, were equivalent to 9.45 ppm of Squoxin in the trout. Squawfish, killed by a single exposure, had maximum residues, as Squoxin, of 3.50 ppm. The field-treated fish were exposed to Squoxin at a concentration of 100 ppb. Analyses were by gas chromatography. Surviving trout contained residues as high as 1.48 ppm (whole body), while dead squawfish contained residues ranging from 0.84 to 2.38 ppm. Residues in the edible tissues of the trout were less than 0.1 ppm. (Author abstract reprinted by permission of the American Chemical Society).

75-2449. Chamberlain, W. F.; Hunt, L. M.; Hopkins, D. E.; Gingrich, A. R.; Miller, J. A.; Gilbert, B. N. (U.S. Livestock Insects Lab., ARS, USDA, Kerrville, TX 78028). **Absorption, excretion, and metabolism of methoprene by a guinea pig, a steer, and a cow.** *J. Agric. Food Chem.* 23(4): 736-742; 1975. (19 references)

When the metabolic fate of methoprene (isopropyl (2*E*, 4*E*)-11-methoxy - 3,7,11-trimethyl - 2,4 - dodecadienoate) was studied in a guinea pig, a steer, and a cow, a rather large percentage of the radiolabel was incorporated in the tissues and respired by the animals. In the urine and feces, a small amount of radiolabel was metabolized into free primary metabolites, somewhat more was incorporated into simple glucuronides, and a considerable quantity of radiolabel was found in polar compounds, possibly complex conjugates or polar biochemicals. No methoprene was found in the urine, but approximately 40% of the radiolabel in feces was contributed by unmetabolized methoprene. The formation of conjugates and the metabolism of methoprene was more extensive in the steer than in the guinea pig. (Author abstract reprinted by permission of the American Chemical Society)

75-2450. Quistad, G. B.; Staiger, L. E.; Bergot, B. J.; Schooley, D. A. (Zoecon Corp. Res. Lab., Palo Alto, CA 94304). **Environmental degradation of the insect growth regulator methoprene. VII. Bovine metabolism to cholesterol and related natural products.** *J. Agric. Food Chem.* 23(4): 743-749; 1975. (24 references)

Samples of fat, muscle, liver, lung, blood, and bile from a steer which received a single dose of [5-^{14}C]methoprene were analyzed for radioactive residues. No primary methoprene metabolites could be characterized, but the majority (16-88%, depending on tissue) of the total tissue radioactivity was positively identified as [^{14}C]cholesterol. A total of 72% of the bile radioactivity was contributed by cholesterol, cholic acid, and deoxycholic acid. Radioactivity from catabolized methoprene was also associated with protein and cholesteryl esters of fatty acids. (Author abstract reprinted by permission of the American Chemical Society)

75-2451. Quistad, G. B.; Staiger, L. E.; Schooley, D. A. (Zoecon Corp. Res. Lab., Palo Alto, CA 94304). **Environmental degradation of the insect growth regulator methoprene. VIII. Bovine metabolism to natural products in milk and blood.** *J. Agric. Food Chem.* 23(4): 750-753; 1975. (23 references)

[-^{14}C]Methoprene was extensively metabolized by a lactating dairy cow to acetate which was isolated from blood as randomly labeled acetic acid. Radioactive acetate incorporated into milk fat which was degraded to

radiolabeled saturated, monoenoic, and dienoic fatty acids. Also isolated from milk were radioactive lactose, lactalbumin, and casein. The presence of [^{14}C]cholesterol (free and esterified) was confirmed in blood, in agreement with a previous study in a steer. (Author abstract reprinted by permission of the American Chemical Society)

75-2452. Rumsey, T. S.; Williams, E. E.; Evans, A. D. (A.R.S. Nutr. Inst., Ruminant Nutr. Lab., Beltsville, MD 20705). **Tissue residues, performance and ruminal and blood characteristics of steers fed ronnel and activated carbon.** *J. Anim. Sci.* 40(4): 743-749; 1975. (18 references)

The effects of ronnel and activated carbon (AC) on the feedlot performance, diet digestibility, and ruminal and blood characteristics of 16 steers (362 kg body weight) were studied in a 90-day trial. The steers were fed a 70% concentrate diet containing 0 or 4.5 mg ronnel/kg body weight plus 0 or 5% AC. Ronnel was not detected in the livers, and AC decreased its accumulation in the fat tissue by 31%. In addition, the inclusion of AC in the diets of the ronnel-fed steers markedly reduced the toxicity of their ruminal fluid to house flies but did not significantly affect the toxicity of the whole blood to stable flies. Ronnel plus AC had no significant effect on weight gain, feed intake, diet digestibility, or nitrogen balance, although the daily weight gain and daily feed intake were somewhat increased in the ronnel-fed steers (1.2 kg vs. 1.0 kg and 11.3 kg vs. 10.5 kg). The daily fecal mineral excretion also appeared greater for the AC-fed steers. The ruminal characteristics were not significantly affected by ronnel and AC, but the percentage of acetate was higher in the ronnel-fed animals. The levels of plasma total essential amino acids, nonessential amino acids, and ammonia were also higher in the ronnel-fed animals. AC had little effect on the blood characteristics.

75-2453. Hembry, F. G.; Smart, L. I.; Binder, T. D.; Dixon, J. M. (Louisiana State Univ., Baton Rouge, LA). **Hexachlorobenzene decontamination of beef cattle.** *J. Anim. Sci.* 41(1): 269; 1975.

Yearling and weanling steers averaging 38.7 and 5.8 ppm hexachlorobenzene (HCB) per kg in the body tissues were maintained on low and high energy diets supplemented in some cases with 1.0 g sodium phenobarbital or 1.0 g iodinated casein per 45 kg body weight or with 0.2% thiouracil. Ten cows in the last month of pregnancy were also studied; they averaged 19 ppm HCB in the body tissues. In all steers, the HCB concentrations in the body tissues were reduced as a function of time and weight gain; the different dietary treatments produced no significant differences in the rate of HCB decontamination. All calves produced by the pregnant cows contained the same HCB concentrations as their dams, indicating a transfer of HCB from cow to fetus. HCB was also excreted in the milk, resulting in greater HCB concentrations in the suckling calves than in the dams during the first 2 months of lactation.

75-2454. Reynolds, P. J.; Lindahl, I. L.; Cecil, H. C.; Bitman, J. (A.R.S. Nutr. Inst., Ruminant Nutr. Lab., Beltsville, MD). **DDT and methoxychlor accumulation and depletion in sheep.** *J. Anim. Sci.* 41(1): 274; 1975.

The rates of accumulation and depletion of orally administered DDT and methoxychlor (MeOCl) were studied in the tissues of yearling ewes. Three groups of crossbred animals were confined on raised screens and fed *ad lib* a basal ration supplemented with 250 ppm *p,p'*-DDT, 250 ppm MeOCl, or 2,500 ppm MeOCl. The insecticides were incorporated into the ration for 18 weeks and were removed during the subsequent 16 weeks. The levels of DDT, *p,p'*-DDT, and *p,p'*-DDD (TDE) in the s.c. adipose tissue plateaued after 8 weeks at 528, 25, and 74 ppm, respectively. In the 250-ppm MeOCl group, the insecticide levels in the adipose tissue reached 8 ppm in 8 weeks then declined linearly at a rate of 0.09 ppm/day. In the 2,500-ppm MeOCl group, the insecticide levels in the adipose tissue plateaued after 6 weeks at 24 ppm. After pesticide administration ceased, the DDT levels in the adipose tissue declined at a rate of 0.0077 ppm/day, the DDE levels declined at 0.0031 ppm/day, and the DDD levels declined at 0.026 ppm/day; in the 250-ppm MeOCl group, MeOCl declined at 0.055 ppm/day, and in the 2,500 ppm group, it declined at 0.11 ppm/day.

75-2455. Nazer, I. K.; Archer, T. E.; Gary, N. E.; Marston, J. (Dep. Environ. Toxicol., Univ. California, Davis, CA 95616). **Honeybee pesticide mortality: intoxication versus acetylcholinesterase concentration.** *J. Apic. Res.* 13(1): 55-60; 1974. (31 references)

The oral toxicity of malathion on foraging bees and on younger non-foraging bees was investigated and the concentration and activity of the acetylcholinesterase (AChE) obtained from the brain of bees of these two age groups was correlated with the percentage mortality induced by the pesticide. Bees were fed concentrations of malathion ranging from 0 to 18 ppm, 40-60 min after capture. Baseline AChE activity was established in honeybees from three sources: foraging bees (Group 1), upper brood nest area (Group 2), honey storage area (Group 3). The AChE concentration was 70, 142.5, and 143.5 units/brain from Groups 1, 2, and 3, respectively, compared with a standard preparation of crystalline bovine erythrocyte AChE. Malathion oral LD50 in 1-M sugar syrup was 0.41, 0.82, and 0.87 μg/bee for Groups 1, 2, and 3, respectively, after 24 hr exposure to the toxicant. Acetylcholinesterase in vitro studies, in which bee head homogenate was the enzyme source, gave malaoxon molar I50 64.0 p*M* for Group 1 and 0.19 n*M* for Group 2 and 3. The data indicates differences in AChE concentration, rather than differences in enzymatic activity, in bee brain at different stages of maturity. Bees with less brain enzyme (foragers, Group 1) were more susceptible to organophosphorus AChE inhibitors than younger bees (Group 2 and 3), which had higher concentrations of brain enzyme.

75-2456. Kalra, R. L. (Dep. Entomol., Punjab Agric. Univ., Ludhiana, India). **Mechanisms of DDT resistance in *Culex pipiens fatigans*.** *J. Med. Entomol.* 11(4): 437-441; 1974. (29 references)

Quantitative data was collected on the metabolism of *p,p'*-DDT and its analogs in larvae of susceptible and resistant strains of *Culex pipiens fatigans* originating from California, Delhi, and Rangoon. The larvae were exposed to 0.5 ppm *p,p'*-DDT in 500 ml water for 24 hr, after which they were ground, extracted, and analyzed by electron capture gas chromatography. The principal metabolite in both the susceptible and resistant strains was *p,p'*-DDE, and the dehydrohalogenation of DDT played a minor role as a defense mechanism against the toxic effects of the pesticide in the case of specific resistance to *p,p'*-DDT and its dehydrochlorinatable analogs. Studies on metabolism and cross-resistance indicated the presence of at least three mechanisms of DDT resistance in this species, the mechanism varying from strain to strain. The relative in vivo metabolism of *p,p'*-DDT and its analogs suggested that the DDTase in *C. p. fatigans* is different from the enzyme found in the house fly and *Aedes aegypti*.

75-2457. Powers, C. F.; Stay, F. S.; Sanville, W. D. (Pacific Northwest. Environ. Res. Lab., Corvallis, OR). **Aquatic sediments.** *J. Water Pollut. Control Fed.* 47(6): 1611-1617; 1975. (64 references)

Studies on chemical transformation in aquatic sediments caused by pesticides are reviewed. An acetone-hexane procedure for extraction of chlorinated insecticides from sediments, followed by separation with adsorption chromatography, was developed and an average recovery of nearly 100% for contaminated sediments was achieved. Pesticide residues were monitored in sediment and water samples collected from five Lake Erie tributaries. Only infrequent sporadic occurrences of minute concentrations were found, particularly of diazinon, dieldrin, and the DDT family of compounds. The effect of mirex on microbial populations and its possible degradation under aerobic and anaerobic conditions was examined. No degradation in aerobic soils or anaerobic sediments after 6 mo of incubation were reported. The interaction of sulfur metabolizing bacteria and ethion, a sulfur containing organophosphate pesticide, was investigated. Hydrogen sulfide was produced in the ethion-enriched sediments and bacterial subcultures derived from these sediments. Transformations caused by heavy metals and nutrients are also described.

75-2458. McKim, J. M.; Benoit, D. A.; Biesinger, K. E.; Brungs, W. A.; Siefert, R. E. (Natl. Water Qual. Lab., EPA, Duluth, MN). **Effects of pollution on freshwater fish.** *J. Water Pollut. Control Fed.* 47(6): 1711-1768; 1975. (409 references)

Studies on the effects of insecticide pollution on freshwater fish are reviewed. Information is included on hexachlorobenzene residues in various species of freshwater and anadromous fish; measurement of organochlorine residues in river and lake sediment; monitoring of mirex residues in selected organisms; the degradative fate of potential pollutants; toxicity of pyrethrum and fenitrothion to fish; dieldrin accumulation and elimination by channel catfish; toxicity of agricultural chemicals to fish inhabiting Korean rice fields; effects of dieldrin on metabolism of rainbow trout; effects of DDT on enzyme metabolism in rainbow trout; avoidance behavior of insecticide susceptible and resistant populations of mosquitofish to various pesticides; toxicity of 2,4-D to coho salmon; and the effects of ^{14}C-carbaryl, ^{14}C-TFM, and ^{14}C-DDT on rainbow trout.

75-2459. Osumi, Y.; Fujiwara, H.; Oishi, R.; Takaori, S. (Dep. Pharmacol., Fac. Med., Kyoto Univ., Sakyo-ku, Kyoto, Japan). **Central cholinergic activation by chlorfenvinphos, an organophosphate, in the rat.** *Jpn. J. Pharmacol.* 25(1) 47-54; 1975. (16 references)

The effects of chlorfenvinphos on electroencephalogram (EEG), electromyogram (EMG), and cholinesterase (ChE) activity in the brain and red blood cells were investigated in male Wistar rats. Chlorfenvinphos up to 1 mg/kg p.o. did not affect the ChE activity and the awake-sleep cycle. In doses over 2 mg/kg, the ChE activity in the brain and red blood cells significantly decreased. The spontaneous EEG showed a prominent arousal pattern and appearance of slow wave sleep and parasleep was markedly depressed. Maximum inhibition of brain ChE activity was obtained 3 hr after treatment and lasted for more than 72 hr. The duration of arousal pattern was proportional to the doses; however, the awake-sleep cycle returned to control on the 2nd day and a rebound increase in parasleep occurred on the 3rd day. Atropine depressed the EEG arousal pattern induced by chlorfenvinphos without affecting ChE activity in the brain. These results indicate that the appearance of the EEG arousal pattern after chlorfenvinphos may be derived from central cholinergic activation.

75-2460. Dean, B. J.; Doak, S. M. A.; Somerville, H. (Shell Res. Ltd., Tunstall Lab., Sittingbourne, Kent, England). **The potential mutagenicity of dieldrin (HEOD) in mammals.** *Food Cosmet. Toxicol.* 13(1): 317-323; 1975. (24 references)

Mutagenicity studies have been carried out in CF1 mice and Chinese hamsters after oral dosing with HEOD, the major constituent of dieldrin. A dominant lethal assay was carried out in which male CF1 mice were dosed orally with 12.5, 25 or 50 mg HEOD/kg. Chinese hamsters of both sexes were given single oral doses of 30 or 60 mg HEOD/kg; and 8 or 24 hr after dosing, femoral bone marrow was obtained and analyzed for chromosome changes. Host-mediated assays were carried out on male CF1 mice either given a single oral dose of 25 or 50 HEOD/kg or dosed orally on five successive days with 5 or 10 mg HEOD/kg. *Saccharomyces cerevisiae* was the test organism and the

genetic change measured was mitotic gene conversion. The three test systems showed no evidence of the induction of dominant lethality, chromosome breakage or gene conversion in animals dosed with HEOD. Additional chromosome studies were carried out on short-term lymphocyte cultures from workers currently or previously employed in a dieldrin manufacturing plant. The degree of chromosome damage did not differ significantly from that found in a control group of workers. These findings suggest that HEOD does not present a mutagenic hazard in mammals. (Author abstract by permission)

75-2461. Eisenbrand, G.; Ungerer, O.; Preussmann, R. (Inst. Toxikol. Chemother., Deutschen Krebsforschungszentrum, Heidelberg, Germany). **The reaction of nitrite with pesticides. II. Formation, chemical properties and carcinogenic activity of the *N*-nitroso derivative of *N*-methyl-1-naphthyl carbamate (carbaryl).** *Food Cosmet. Toxicol.* 13(3): 365-367; 1975. (12 references)

Nitrosation of the insecticide *N*-methyl-1-naphthyl carbamate (carbaryl) with a fivefold molar excess of nitrite was measured at carbaryl concentrations of 10^{-3}—$10^{-4}M$. The maximum yield of the *N*-nitroso product was about 2 and 1½ of the theoretical at the 10^{-3} and $10^{-4}M$ levels respectively. Dependence of the rate of nitrosation on pH was investigated and the highest yields were found to be obtained in 1 *N*-HCl. The chemical and physicochemical properties of synthesized *N*-nitrosocarbaryl were determined. When administered in a single s.c. injection of 1000 mg/kg to Wistar rats, *N*-nitrosocarbaryl induced local sarcomas at the site of injection. Single oral doses of 200-1500 mg/kg produced no tumors in 21 months in a continuing experiment. (Author abstract by permission)

75-2462. Nelson, B. D. (Dep. Biochem., Arrhenius Lab., Univ. Stockholm, Fack, Stockholm, Sweden). **The action of cyclodiene pesticides on oxidative phosphorylation in rat liver mitochondria.** *Biochem. Pharmacol.* 24: 1485-1490; 1975. (20 references)

The effects of a number of chlorinated hydrocarbon pesticides have been studied on isolated rat liver mitochondria. Inhibition of mitochondrial function was found to be dependent upon the ratio of pesticide to protein, and to some extent upon the type of pesticide. Most of the pesticides tested exerted more than one effect depending upon the concentration. At low concentrations (less than 20-25 nmoles/mg protein), State 3 respiration, DNP-activated respiration and valinomycin-induced swelling were inhibited by certain cyclodienes. These results cannot be explained by inhibition of the electron transport chain or uncoupling. They appear to be associated with restrictions of ion movements across the membrane (DNP, valinomycin-K^+ complex, ADP). On increasing the concentration of pesticide, lysis of the membranes and uncoupling can be induced. The electron transport chain can also be inhibited, but only with 5-10 times greater concentrations of pesticide than required for uncoupling. In general, the cyclodiene pesticides are slightly more effective inhibitors than the non-cyclodienes tested. The effectiveness of the cyclodiene is, however, dependent upon its stereo-chemical properties. These findings suggest that the cyclodienes may inhibit mitochondria in a common, and, perhaps, specific manner. The specificity and mode of action of cyclodienes was found to be similar to that described earlier using growing yeast cells as the test system. (Author abstract by permission)

75-2463. Timmons, E. H.; Chaklos, R. J.; Bannister, T. M.; Kaplan, H. M. (Dep. Phys., Southern Illinois Univ., Carbondale, IL 62901). **Dichlorvos effects on estrous cycle onset in the rat.** *Lab. Anim. Sci.* 25(1): 45-47; 1975. (17 references)

The effects of dichlorvos on the onset of the estrous cycle in rat were investigated with outbred albino rats, Crl:COBS CD (SD) BR. The animals were placed with a mature male rat in an experimental cage that had 1/2 of a Shell No Pest Strip placed on top of it. It was kept there from birth of the first litter of the group until the estrous cycle appeared in all the females. Rats exposed to dichlorvos came into their first estrous cycle 10 days after control animals. Dichlorvos was recovered in all but one ovarian tissue sample and in almost all blood samples. It was recoverable only occasionally and in minute quantities from the adrenal and kidney samples, and it was found only in traces in one of the 40 brain tissue samples. The metabolite desmethyldichlorvos could not be detected in tissue samples of 30 other animals which were exposed under similar conditions.

75-2464. Poland, A.; Glover, E. (Dep. Pharmacol. Toxicol., Univ. Rochester Sch. Med. Dentistry, Rochester, NY 14642). **Genetic expression of aryl hydrocarbon hydroxylase by 2,3,7,8-tetrachlorodibenzo - *p*-dioxin: evidence for a receptor mutation in genetically non-responsive mice.** *Mol. Pharmacol.* 11(4): 389-398; 1975. (17 references)

Hepatic aryl hydrocarbon hydroxylase activity is induced by 2,3,7,8-tetrachlorodibenzo - *p*-dioxin (TCDD) in all inbred strains of mice tested. The genetically "non-responsive" strains of mice which fail to respond to the usual aromatic hydrocarbons (e.g., 3-methylcholanthrene) are induced by TCDD; however, the dose required is greater than for the genetically "responsive" strains. The dose of TCDD that elicits half the maximal enzyme activity (ED50) in responsive strains, C57BL/6J, BALB/cJ, and A/J, is approximately 1 nmole/kg, and in the nonresponsive strains, DBA/2J, AKR/J, and SJL/J, the ED50 is at least 10 nmole/kg. In the above strains, TCDD at 3 nmole/kg fails to induce hepatic aryl hydrocarbon hydroxylase activity in nonresponsive mice, but elicits 70% or more of the observed maximal enzyme activity in responsive strains. In 14 inbred strains of mice, the phenotypic characteristic of aromatic hydrocarbon responsiveness or nonresponsiveness can be detected equally well by a challenge with 3-methylcholanthrene (0.3 mmole/kg) or TCDD at 3

nmole/kg. In all nonresponsive strains, a 10-fold higher dose of TCDD induces hepatic enzyme activity. The heterozygous offspring of C57BL/6J and DBA/2J parents are distinguishable from both parental strains by an intermediate sensitivity to TCDD. We conclude from these data that the genetically nonresponsive mice have the structural and regulatory genes necessary for the expression of aryl hydrocarbon hydroxylase. The most likely explanation of the defect in nonresponsive mice appears to be a mutation which results in an induction receptor site with a diminished affinity for inducing drugs, leading to an almost absolute unresponsiveness to 3-methylcholanthrene and a diminished sensitivity to the more potent inducer, TCDD. (Author abstract by permission of Academic Press)

75-2465. Niwa, A.; Kumaki, K.; Nebert, D. W. (Sect. Dev. Pharmacol., Neonatal Pediat. Med. Br., Natl. Inst. Child Health Hum. Dev., Natl. Inst. Health, Bethesda, MD 20014). **Induction of aryl hydrocarbon hydroxylase activity in various cell cultures by 2,3,7,8-tetrachlorodibenzo-*p*-dioxin.** *Mol. Pharmacol.* 11(4): 399-408; 1975. (29 references)

The kinetics of aryl hydrocarbon (benzo[*a*]pyrene) hydroxylase induction by 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) among 10 established cell lines, as well as fetal primary cultures derived from hamster, rat, chick, rabbit, and four inbred strains of mice, and cultured human lymphocytes, is very similar to the time course of hydroxylase induction by 3-methylcholanthrene (MC) as the inducer. The TCDD-inducible process is sensitive to actinomycin D and cycloheximide at levels similar to those previously reported with MC in culture. (Author abstract by permission of Academic Press, abridged.)

75-2466. Kappas, A.; Georgopoulos, S. G. (Nuclear Res. Cent. "Democritus", Biol. Dep., Athens, Greece). **Fungicides causing mitotic segregation in Aspergillus diploids.** *Mutat. Res.* 29(2): 236; 1975.

The aromatic hydrocarbon fungicides, Botran (2,6-dichloro-4-nitroaniline), Chloroneb (1,4-dichloro-2,5-dimethoxybenzene), PCNB (pentachloronitrobenzene) and SOPP (sodium orthophenylphenate) affected the stability of *Aspergilus nidulans* diploid strains. They increased the number of white and yellow segregants in colonies grown from conidia of heterozygous green diploids. Growth inhibition increased with increasing concentration of the fungicides proportionally to the total number of induced segregants. The contribution of haploidization to induced segregation was greater as fungicide concentration increased, indicating that the fungicides cause non-disjunction. (Author abstract by permission)

75-2467. Vogel, E. (Dep. Radiat. Genet. Chem. Mutagenesis, Univ. Leiden, Leiden, The Netherlands). **Some aspects of the detection of potential mutagenic agents in Drosophila.** *Mutat. Res.* 29(2): 241-250; 1975. (48 references)

The Drosophila system is a valuable test for detecting and characterizing mutagenic agents. Tester strains are available or can be synthesized for determining almost all types of genetical changes ranging from gene mutations to chromosome rearrangements in a great variety of cell types of both sexes. Metabolic activation of all groups of indirect mutagens tested so far (aryldialkyltriazenes, cyclophosphamides, nitrosamines, azo-, hydrazo- and azoxyalkanes, aflatoxins, and polycyclic hydrocarbons; about 35 representatives in all), gives strong although indirect support for the considerable metabolizing ability of Drosophila. This capability would be expected from comprehensive biochemical data on bioactivation of foreign compounds in other insects. From a comparison of which types of genetical change are induced at high, low and threshold concentrations, it appears that lethal tests remain the most reliable method for any screening program. Mutagenic agents such as diethylnitrosamine, hycanthone and certain triazenes, which are highly efficient in the induction of recessive lethals (gene mutations and/or deficiencies), would not have been detected in Drosophila if chromosome breakage were the only indicator for mutagenic activity. Moreover, for several mono- and polyfunctional agents, the lowest dose which is still genetically active was definitely lowest for recessive lethals when compared with dominant lethals, chromosome rearrangements or loss. If a new mutagen is discovered by a screening procedure using Drosophila, an accurate picture of its ability to cause either or both gene mutations and chromosome aberrations can be drawn. Such work will be valuable in helping to clarify similar problems in mammalian systems. For instance, it was important to learn that mutagens of the nitrosamine type apparently fail to produce breakage events in Drosophila. Similarly, three cyclophosphamides appeared not to have chromosome breaking ability. However, from a more detailed study, in which a series of concentrations was used, it became obvious that a penetration effect or more likely a rate-limiting factor in bioactivation, was the cause of the negative results obtained with these agents. (Author abstract by permission)

75-2468. Bridges, B. A. (M.R.C. Cell Mutat. Unit, Univ. Sussex, Falmer, Brighton, England). **The mutagenicity of captan and related fungicides.** *Mutat. Res.* 32(1): 3-34; 1975. (70 references)

The mutagenic, cytotoxic, and teratogenic capacity of captan and related fungicides in bacteria, eukaryotes, animals, and man is reviewed. Captan has no apparent mutagenic effect in Drosophila or maize, but is a potent mutagen in both prokaryotic and eukaryotic cellular systems, producing excisable DNA damage that results in the production of point mutations. It also induces dominant lethal mutations in rats and mice and transmissible second generation effects in mice, probably via polygenic point mutations. In addition, captan in high doses mutates bac-

teria in host-mediated assays, is teratogenic in more than one system, and produces chromosome aberrations in cultured mammalian cells. This chemical presents a potentially appreciable genetic hazard to man, and it may present a carcinogenic hazard. In general, folpet and difolatan have produced results similar to those produced by captan. The present usages of captan should be re-evaluated in a risk-benefit manner, the current permissible levels in foodstuffs should be re-evaluated, and the use of nonmutagenic substitutes with similar low toxicity should be promoted.

75-2469. Sanborn, J. R. (Illinois Natl. Hist. Survey and Board of Trustees, Univ. Illinois, Urbana, IL). **The fate of select pesticides in the aquatic environment.** *Natl. Tech. Inform. Serv.*, PB 239 749, 1974, 93 p.

Five industrial chemicals and 17 organic pesticides were examined in a terrestrial-aquatic model ecosystem in order to determine their persistence and accumulation by the organisms of this system. Insecticides, herbicides, and miticides or plasticizers were studied. Background data obtained by comparing results of this study to field data can be used to assess the potential environmental impact of new pesticides before they are given a recommendation for general use. It was found that most chemicals, except dieldrin, underwent extensive degradation under experimental conditions. More than 96% of the radioactivity isolated from the organisms was unchanged dieldrin, indicating the extreme inertness of this chlorinated hydrocarbon to biological or chemical change.

75-2470. Schmid, A. (Inst. Pharmakol. Toxikol. Pharm., Univ. Muenchen, Munich, Germany). **Investigations into the suitability of oxazepam and diazepam as antidotes against gamma-hexachlorocyclohexane (lindane).** *Naunyn-Schmiedeberg's Arch. Pharmacol.* 287(Suppl.): R100; 1975.

The ability of various tranquilizers to antagonize the toxic effects of lindane was investigated. The tranquilizers were administered intraperitoneally 5 minutes prior to oral administration of lindane to ca. 1100 male SPF-NMRI mice weighing 18-20 g. The 24 hr LD 50 (in each case ± s.d.) values for lindane were: no antidote, 55 ± 24 mg/kg; 15 μM/kg hexobarbital-Na 71 ± 24 mg/kg; 14 μM/kg meprobamate 75 ± 24 mg/kg; 10 μM/kg chlordiazepoxide 87 ± 24 mg/kg; 7.04 μM/kg diazepam 268 ± 25 mg/kg; and 2.32 μM/kg oxazepam 249 ± 24 mg/kg. Higher and lower doses of oxazepam and diazepam were less effective. (Author abstract by permission, modified).

75-2471. Glisson, S. N.; Karczmar, A. G.; Barnes, L. (Dep. Pharmacol. Ther., Loyola Univ. Stritch Sch. Med., Maywood, IL 60153). **Effects of diisopropyl phosphorofluoridate on acetylcholine, cholinesterase and catecholamines of several parts of rabbit brain.** *Neuropharmacology* 13(7): 623-631; 1974. (38 references)

Pretreatment of rabbits with DOPA plus the monoamine oxidase inhibitor, JB 835, resulted in significant elevations in the norepinephrine levels in the thalamus, hypothalamus, midbrain, and hippocampus, and nonsignificant elevations in the dopamine (DA) levels of these structures. There were no significant effects on the cholinesterase activity or acetylcholine (ACh) levels in these structures. Diisopropyl phosphorofluoridate (DFP) administration resulted in nearly complete inhibition of the cholinesterase activity in these structures whether or not the rabbits were pretreated with JB835 plus DOPA. While JB835-DOPA pretreatment also had no effect on the DFP-induced increase in the ACh levels of the caudate nucleus or midbrain, it slightly lowered the DFP-induced increase in the thalamus and hypothalamus. Atropine but not atropine methyl nitrate further lowered the ACh levels in all brain structures. In the JB835-DOPA-pretreated rabbits, DFP decreased the NE levels and increased the DA levels in all brain structures; methyl nitrate prevented the increase in DA but had no effect on the decrease in NE. The results suggest that the effect of DFP on brain NE is centrally mediated, while the effect on DA is at least partially peripheral.

75-2472. Shull, L. R.; Cheeke, P. R. (Dep. Anim. Sci., Oregon State Univ., Corvallis, OR 97331). **Tri-*o*-cresyl phosphate interrelationships with selenium, vitamin E and sulfur amino acids in the rat: growth, hemolysis and glutathione peroxidase.** *Nutr. Rep. Int.* 11(1): 39-48; 1975. (15 references)

A dietary level of 0.2% tri-*o*-cresyl phosphate (TOCP) increased in vitro hemolysis of erythrocytes from male Long-Evans rats fed a low selenium, low vitamin E Torula yeast diet. Low dietary levels of both selenium and vitamin E prevented hemolysis when the incubation medium contained glucose. TOCP completely blocked this effect with selenium, and partially blocked it with vitamin E. In pair-fed rats fed low levels (0, 5, 10, and 20 IU/kg diet) of vitamin E, significant growth responses to vitamin E occurred only in those that did not receive TOCP. The level of glutathione peroxidase was reduced in the liver, but not the erythrocytes, of TOCP-fed rats. Liver selenium content was not influenced by TOCP. Selenite, selenocystine, and selenomethionine were of similar effectiveness in promoting growth of rats fed TOCP. Although dietary cystine improved growth in the presence of TOCP, it did not prevent mortality.

75-2473. Zinck, M. E.; Addison, R. F. (Bedford Inst. Oceanography, Dartmouth, Nova Scotia, Canada). **The effect of temperature on the rate of conversion of *p,p'*-DDT to *p,p'*-DDE in brook trout (*Salvelinus fontinalis*).** *Can. J. Biochem.* 53(5): 636-639; 1975. (9 references)

As part of a study of the effects of environmental factors on *p,p'*-DDT metabolism by fish, the effect of temperature was examined. Brook trout (*Salvelinus fontinalis*) were maintained in flowing fresh water at 2, 10, and

18°C and injected i.m. with *p,p'*-(^{14}C)DDT. Fish were killed at intervals up to 16 weeks after injection, and analyzed by a combination of thin-layer chromatography, gas-liquid chromatography, and liquid-scintillation counting. Only one labelled metabolite, *p,p'*-DDE, was detected during the experimental period. Its rate of production varied with temperature. After 16 weeks about 9, 13, and 19% of the original *p,p'*-DDT in fish maintained at 2, 10, and 18°C, respectively, had been converted.

75-2474. Blake, J.; Kaufman, D. D. (Pestic. Degrad. Lab., Agric. Environ. Qual. Inst., Beltsville, MD 20705). **Characterization of acylanilide-hydrolyzing enzyme(s) from *Fusarium oxysporum* Schlecht.** *Pestic. Biochem. Physiol.* 5(4): 305-313; 1975. (26 references)

The acylamidases induced by an acylanilide substrate (propanil) and the methylcarbamate (PPG-124) known to inhibit the hydrolytic action of these enzymes have been isolated. The characterization of these induced acylamidases is described. Acylamidase enzymes induced in the soil fungus *Fusarium oxysporum* Schlecht. by 3',4'-dichloropropionanilide (propanil) and *p*-chlorophenyl methylcarbamate (PPG-124) were characterized according to pH optima, substrate specificity, specific activity, and sensitivity to various inhibitors. Both propanil- and PPG-124-induced enzymes were separated by ultrafiltration into fractions greater than 100,000 and 500,000 MW. Both unique and similar characteristics were observed with the various enzyme preparations. Experimental parameters examined failed to unequivocally demonstrate whether any of the amidases induced were identical. Instead, the results indicated the possible presence of different amidases.

75-2475. Whitehouse, L. W.; Ecobichon, D. J. (Dep. Pharmacol., Dalhousie Univ., Halifax, Nova Scotia, Canada). **Paraoxon formation and hydrolysis by mammalian liver.** *Pestic. Biochem. Physiol.* 5(4): 314-322; 1975. (36 references)

In vitro studies were made of the desulfuration of parathion at 37°C by liver tissue from males and females of 9 mammalian species. These studies showed sex and species variation in initial rates of parathion desulfuration and arylesterase-catalyzed hydrolysis of the oxygen analogue, paraoxon. Double reciprocal plots of initial rates of parathion activation for representative males and females of each species gave *K*m values ranging from 0.02 to 0.1 m*M* parathion. Sex differences in activation were noted only in guinea pigs and rats; the males possessed higher desulfurating abilities than the corresponding females. Based on the sex possessing the higher desulfurating ability, the species pattern of decreasing activity was in the order hamster, guinea pig, mouse, rat, rabbit, bovine, dog, porcine, and cat. Studies of paraoxon hydrolysis indicated that only rats showed sex differences in hydrolysis, males possessing higher arylesterase activity than females. The species pattern of decreasing hydrolytic activity was in the order mouse, bovine, rat, guinea pig, rabbit, hamster, cat, dog, and porcine.

75-2476. Kuhr, R. J.; Davis, A. C. (Dep. Entomol., New York State Agric. Exp. Stn., Geneva, NY). **Toxicity and metabolism of carbaryl in the European corn borer.** *Pestic. Biochem. Physiol.* 5(4): 330-337; 1975. (21 references)

Larvae from 2 strains of the European corn borer, *Ostrinia nubilalis* (Hubner), were compared for differences in tolerance and metabolism of carbaryl. The Geneva strain was about twice as susceptible to carbaryl, but both Valley and Geneva borers converted carbaryl to oxidative metabolites at similar rates in vivo and in vitro. Maximum carbaryl-metabolizing activity was present in last-instar larvae, particularly in the fat body and gut tissues. However, the specific activity of gut homogenates was highest in the Geneva strain and the specific activity of fat body was highest in the Valley strain. Other differences in the mixed-function oxidase systems of gut and fat body were also found. The major metabolite in vivo and in vitro was hydroxymethyl carbaryl. The results of this study do not support any large differences in the toxicity or metabolism of carbaryl by the 2 corn borer strains. The most notable variation was the specific activity reversal of gut and fat body, although total metabolism by whole larvae was the same. In fact, differences found in metabolite pattern and response to cofactors and metal ions between the gut and fat body within one strain were greater than any interstrain differences. Thus, although a mixed-function oxidase system was responsible for carbaryl metabolism in both tissues, there must exist some differences in the nature of the enzyme complex.

75-2477. Kumar, S. S.; Sikka, H. C.*; Saxena, J.; Zweig, G. (Life Sci. Div., Syracuse Univ. Res. Corp., Syracuse, NY 13210). **Membrane damage in human erythrocytes caused by captan and captafol.** *Pestic. Biochem. Physiol.* 5(4): 338-347; 1975. (40 references)

Treatment of human erythrocytes with 0.5 μM captan or captafol caused a rapid increase in the efflux of intracellular potassium. Captafol has a more pronounced effect than captan on cation permeability. Captafol also decreased anion permeability whereas captan did not affect this process. Glutathione (0.5 μM) had little effect in reducing potassium efflux when added to the cells after they were incubated for 1 hr with captan or captafol, but it was effective when added to the cells prior to their treatment with the fungicides. Captafol increased osmotic fragility of the cells. Incubation of the cell membranes with captafol resulted in the liberation of a small fraction of membrane phospholipids, whereas captan produced no effect. Both the fungicides readily reacted with the sulfhydryl groups in the isolated membrane; 31.5 and 45.7% of the membrane sulfhydryl groups had disappeared following treatment with captan and captafol, respectively. It is suggested that the reaction of captan or captafol and/or their reaction products with the sulfhydryl and amino

groups of the red cell membrane protein produced changes in the structure of the membrane with consequent alteration in its permeability.

75-2478. Benschop, H. P. (Chem. Lab. TNO, Rijswijk, The Netherlands). **The absolute configuration of chiral organophosphorus anticholinesterases.** *Pestic. Biochem. Physiol.* 5(4): 348-349; 1975. (9 references)

Bovine erythrocyte acetylcholinesterase is inhibited preferentially by the same (*S*)p-isomers of the two closely related anticholinesterases *O*-2-butyl *S*-2-(dimethylammonium)ethyl ethylphosphonothioate hydrogen oxalate (I) and *O*-isopropyl *S*-2-(trimethylammonio)ethyl methylphosphonothioate iodide (II). The apparent disagreement with previous reports is due to reassignment of the absolute configuration of the (-) enantiomer and its methiodide based on additional chemical correlations and confirmed by X-ray analysis. Apparently, the preferential inhibition of AChE by the stereoisomers of chiral organophosphorus compounds is retained for a wide range of leaving groups, although these groups vary greatly in their hydrophobic, ionic, and hydrogen-bonding interactions with the esteratic and/or anionic sites of AChE.

75-2479. Chiu, Y. C.; Black, A. L.; Fukuto, T. R. (Div. Toxicol. Physiol., Dep. Entomol., Univ. California, Riverside, CA 92502). **Thiolysis as an activation process in *N*-sulfenylated derivatives of methylcarbamate esters.** *Pestic. Biochem. Physiol.* 5(4): 359-366; 1975. (12 references)

A study was made of the metabolism of *N*-(2-toluenesulfenyl)carbofuran to generate carbofuran as the principal product. The high activity of denatured microsomes suggests that the N-S bond is cleaved by a chemical rather than an enzymatic process. Biological tissues, including subcellular fractions of mouse liver, heat-denatured microsomal enzymes, mouse blood, commercial protein, and housefly homogenate, as well as thiol reagent, readily effected the cleavage of the N-S bond. The inhibitory effect of sulfhydryl inhibitors such as *N*-methylmaleimide and *p*-chloromercuribenzoate in the incubation system suggests that thiol residues in biological tissue are involved in this thiolytic reaction. Results from the kinetic and product analyses also support this conclusion. Although the results of this study provide insight into the nature of the alteration reactions with *N*-(2-toluene sulfenyl) carbofuran and other sulfenylated carbamates undergo in mammals, they are, however, contrary to the rational proposed for the selective toxicity of these materials. While toxicity to insects may be explained on the basis of in vivo thiolysis of the N-S bond to generate the toxic methylcarbamate, the same explanation argues against the reduced mammalian toxicity of sulfenylated carbamates owing to the ubiquitous nature of sulfhydryl groups in mammalian tissue. Since these results show that carbofuran is rapidly generated *N*-(2-toluenesulfenyl) carbofuran in vitro by a variety of mammalian tissues, the much lower mammalian toxicity of *N*-(2-toluenesulfenyl) carbofuran compared to carbofuran is difficult to explain, particularly since the cleavage of the N-S bond appears nonenzymatic in nature.

75-2480. Richmond, D. V.; Phillips, A. (Long Ashton Res. Stn., Univ. Bristol, Bristol, England). **The effects of benomyl and carbendazim on mitosis in hyphae of *Botrytis cinerea* Pers. ex Fr. and roots of *Allium cepa* L.** *Pestic. Biochem. Physiol.* 5(4): 367-379; 1975. (42 references)

The effects of benomyl and carbendazim on mitosis in hyphae of *Botrytis cinerea* and root tips of onion *Allium cepa* were studied. The effect of the fungicides on root tips was compared with the effect produced by griseofulvin. Benomyl or carbendazim had a rapid effect on dividing hyphal nuclei. The effects of the fungicides were apparent 5 min after administration and the normal stages of division were not seen clearly in any of the treated material. Chromosomes became visible at prophase-metaphase, but they did not separate completely. At the end of division, the chromatin became stretched into long threads, daughter nuclei did not separate completely, and chromatin was often present as irregularly shaped masses. Benomyl and carbendazim induced abnormalities in cell division in about 3% of onion root tip cells. After treatment for 6 hr, formation of the cell plate was inhibited and cells were seen with two nuclei. Other aberrations produced were lagging chromosomes and anaphase bridges. After 3 days, chromosomes sometimes occurred as amorphous clumps, and nuclei were found with more than two nucleoli. Griseofulvin produced similar effects in onion root tip cells, but the chromosome bridges persisted through to telophase. These results show that benomyl and carbendazim can interfere with mitosis in cells of green plants as well as in hyphae of fungi.

75-2481. Krueger, H. R. (Dep. Entomol., Ohio Agric. Res. Dev. Cent., Wooster, OH 44691). **Phorate sulfoxidation by plant root extracts.** *Pestic. Biochem. Physiol.* 5(4): 396-401; 1975. (17 references)

The enzymes responsible for aliphatic sulfur oxidation in plants were studied using phorate as a plant systemic insecticide and soybeans as the crop. Soybean root homogenates oxidized phorate to phorate sulfoxide. Neither P= nor sulfone derivatives of phorate were detected. Fractionation of soybean root homogenate indicates that the enzyme(s) which oxidize phorate to the sulfoxide are largely (72%) contained in the 25,000 *g* pellet. In vitro studies of the 25,000 *g* pellet indicate a linear reaction rate at 34°C for periods of up to 2 hr at the pH optimum of 5.5. Soybean and bean root 25,000 *g* pellets were twice as active on a mg protein basis as those from barley, corn, wheat, or sorghum and over 10 times more active than tomato. In vitro studies indicate that Counter, disulfoton, fenthion, aldrin, heptachlor, piperonyl butoxide, sulfoxide, atrazine, SKF525A, and *p*-chloro thioanisole significantly inhibited soybean root phorate sulfoxidation when present at a 10:1 ratio with phorate.

75-2482. Anonymous. **TCDD—a potent inducer.** *Drug Metab. Disposition* 3(4): 322; 1975. (10 references)

TCDD is the most potent inducer of drug-metabolizing enzyme systems known. An oral dose of 1 μg/kg in rats causes a significant increase in the cytochrome P-450 levels in the liver and greatly induces the activities of benzpyrine hydroxylase, biphenyl 2- and 4-hydroxylase, aniline hydroxylase, zoxazolamine hydroxylase, and UDP-glucuronyltransferase. Zoxazolamine paralysis time is greatly shortened after TCDD pretreatment, while hexobarbital sleeping time is greatly increased. Microsomal demethylase activities toward benzphetamine, aminopyrine, and ethylmorphine are greatly reduced in rats. The inductive effects of TCDD are quite persistent and independent of the age of the animal, while the suppression of *N*-demethylase activities is less persistent and age-dependent. The effects of the toxicant on the constituents of the smooth and rough endoplasmic reticulum vary and there is a great deal of substrate, organ, and species specificity in its action. This compound may be of value in the study of the mechanism of regulation of drug metabolism.

75-2483. Yurovskaya, E. M. (A. N. Marzeev Kiev Sci. Res. Inst. Gen. Environ. Hygiene, USSR). **Behaviour and indicator value of some microorganisms under conditions of soil contamination by pesticides.** *J. Hyg. Epidemiol. Microbiol. Immunol.* 19(1): 10-16; 1975. (8 references)

The effects of two organophosphorus pesticides (chlorophos and metaphos) on *Escherichia coli, Streptococcus faecalis 134* (an enterococcus) and *Shigella* organisms present in chernozem, podzolic, and loamy soils were investigated. Sterile soil samples were inoculated with cultures of the test bacteria, treated with insecticide, and incubated under natural illumination at 20-25°C. The organisms studied showed a high level of resistance to the two insecticides, their behavior being changed only by pesticide levels far exceeding those found under natural conditions. With regard to chlorophos and metaphos resistance, *E. coli* was more similar to the *Shigella* organisms than was the enterococcus, the latter being a less reliable indicator of pesticide soil contamination than was *E. coli*.

75-2484. Dale, D. (Div. Entomol., Kerala Agric. Univ., Vellayani, India). **Studies on the inhibition of cholinesterase from Indian honey bee, *Apis indica*.** *Pesticides* 9(2): 25; 1975. (4 references)

The inhibition of cholinesterase by diazoxon, sumioxon, carbofuran, 3-hydroxy-carbofuran, and 3-keto-carbofuran in the Indian honey bee *Apis indica* was investigated. The reaction mixture consisted of 0.1 ml enzyme and 0.1 ml inhibitor in a solution of saline, dithionitrobenzoic acid, and acetylthiocholine bromide. A comparison of the I_{50} values of different pesticides with 0.1 ml of enzyme in the reaction mixture showed that sumioxon was the most potent inhibitor of honey bee cholinesterase, followed by carbofuran, 3-OH-carbofuran, 3-keto-carbofuran, and diazoxon. The selectivity of sumioxon may be due to differential metabolic pathways or to the differences in the properties of the target enzyme. There is considerable evidence to suggest that cholinesterases obtained from various sources differ in their properties.

75-2485. Maleszewska, T. (Dep. Communal Hyg., Natl. Inst. Hyg., Warsaw, Poland). **Degradation of methyl parathion by microorganisms occurring in surface water and sewage.** *Pol. Arch. Hydrobiol.* 21(1): 163-171; 1974. (17 references)

The disintegration of *O,O*-dimethyl*O*-*p*-nitrophenyl phosphorothioate by bacteria occurring in surface water and sewage was investigated. From media inoculated with water from the Vistula and from municipal sewage, a total of 20 bacteria strains was isolated. The investigation revealed the degradation of *p*-nitrophenol by 4 strains, of which only *Bacillus cereus* was able to disintegrate methyl parathion. The rate of biodegradation was accelerated by the presence of additional organic compounds in the substratum. The enrichment of the medium by peptone caused rapid degradation of methyl parathion, suggesting the significance of amino acids in the biodegradation of that compound by bacteria. The most rapid degradation was observed in the presence of serine, threonine, asparagine, and alanine. These studies suggest that microbial degradation of some organophosphate insecticides in surface waters may be in some cases a long-lasting process, dependent on many factors.

75-2486. Kuzan, F. B.; Prahlad, K. V. (Dep. Biol. Sci., Northern Illinois Univ., DeKalb, IL 60115). **The effects of 1,2,3,4,10,10 - hexachloro - 1,4,4a,5,8,8a - hexahydroxy *endo, exo*-5, 8 - dimethionaphthalene [sic] (aldrin) and sodium ethylenebisdithiocarbamate (nabam) on the chick.** *Poultry Sci.* 54(4): 1054-1064; 1975. (26 references)

Fertile White Leghorn chicken eggs were injected on the tenth day of incubation with either 0, 10, 20, 30, 40 or 50 ppm aldrin or 0, 5, 10, or 15 ppm nabam and allowed to hatch. Aldrin neither induced any deformities nor had any effect on hatchability, thyroid weight, and histology. However, within three days after hatching, there was greater mortality in chicks treated with higher concentrations of the pesticide. Aldrin at higher concentrations significantly reduced ^{125}I uptake by the thyroids. This was evidenced in the iodine fractions after chromatographic separation of the thyroid extracts. Nabam not only reduced hatchability but also induced deformities in the higher concentration groups. The thyroids showed an increase of resorption vacuoles in the colloid. Even though the thyroid weights increased in all experimental groups, a significant increase in ^{125}I uptake was seen only in the 15 ppm injected animals. This group also showed a reduction in radioactivity of thyroxine fraction but an increase of ^{125}I in tyrosines. The significance of these results is discussed. (Author abstract by permission)

75-2487. Bradley, J. W.; Bay, D.; Krueger, W. F. (Dep. Poultry Sci., Texas A&M Univ. College Station, TX 77843). **The effect of Rabon on egg production in layers.** *Poultry Sci.* 54(4): 1331-1332; 1975.

A pilot experiment was initiated to evaluate the effects of Rabon (tetrachlorvinphos) on egg production, feed utilization, and fly control in commercial layers. Initially 100 hens which had completed 12 months production were divided into 5 equal groups and treated as follows: control, 6.0 ppm, 12.0 ppm, 25.0 ppm and 50.0 ppm of Rabon in the diet. The diet consisted of a 16% layer ration fed ad libitum. Ten 200 g samples of feces per treatment were each seeded with 50 first instar house fly larvae and allowed to incubate. Data were collected for a period of 25 days. A second experiment was initiated utilizing young pullets. Emphasis to date has been on reproduction performance and egg size. In the initial experiment, rates of egg production were 52.2, 62.3, 50.9, 58.4 and 64.6 percent for controls, 6.0 ppm, 12.9 ppm, 25.0 ppm and 50.0 ppm groups, respectively. Respective feed utilization rates were 6.45, 7.33, 5.94, 6.69 and 7.72 eggs per kg of feed. Average number of flies resulting from seeding feces samples were 39.8, 29.8, 10.0, and 0.0, 0.0 for the control, 6.0 ppm, 12.0 ppm, 25.0 ppm and 50.0 ppm groups, respectively. Performance in Experiment 2 through 56 days production has been 60.4, 57.2, 62.9, 70.5 and 70.4 percent for the respective treatments. Rabon appears to have no depressing effect on egg production, feed utilization or egg size. (Author abstract by permission)

75-2488. Siegel, H. S.; Latimer, J. W.; Drury, L. N. (Southeast Poultry Res. Lab., Agric. Res. Stn., Athens, GA 30601). **Accumulation and disappearance rates of dieldrin in abdominal fat of broilers.** *Poultry Sci.* 54(4): 1346; 1975.

White Rock chicks were fed a commercial ration containing 1 ppm of the active ingredient of technical grade dieldrin (1,2,3,4,10,10-hexachloro - 6,7-epoxyl - 1,4,4a,5,6,7,8,8a-octahydrol - 1,4 - endo-exo- 5,8 - dimethanonaphthalene) from day-old until they were 2, 4, 6, 8 or 10 weeks of age. The rates of accumulation and clearance of the insecticide from the abdominal fat were determined and prediction equations computed. GLC analysis of abdominal fat sampled at 2-week intervals indicated that dieldrin concentrations increased linearly through 10 weeks of age. In birds in which dieldrin was removed from the ration after the first 2 weeks of feeding, mean concentrations of the insecticide declined to 0.5 ppm or below by 8 weeks of age. However, when the insecticide remained in the diet as long as 4 weeks, concentrations in the fat did not fall below 2 ppm by the end of the experiment at 10 weeks of age. Growth and feed conversion were not significantly affected by dieldrin at this level. (Author abstract by permission)

75-2489. Reyes, J. A.; Calderon, M. (School of Agricultural Sciences, Palmira, Colombia). **Resultados del ensayo realizado para medir el efecto del Fundal sobre la fauna benefica el algodonero en el Valle del Cauca.** [**Test results in the measurement of the action of Fundal on useful fauna of the cotton plant in Valle del Cauca.**] *Acta Agron. (Palmira)* 22(2): 1-10; 1972. (4 references) (Spanish)

On two cotton farms, located 8 miles apart in the Valle del Cauca province of Colombia, tests were made of the effect on ladybugs (coccinelidae) of the use of Fundal 800 (chlorophenamidine), Fundal 500 (chlorophenamidine) and Sinafid M-48 (48% parathion). Separate parcels of land were sprayed with each pesticide, then the cumulative mortality of the coccinelids was observed for 72 hours. A small section of each tract was also examined one hour after application to determine immediate mortality of the beneficient insects. In both cases the results indicated that the Fundal preparations are considerably less fatal to the ladybugs.

75-2490. Blomquist, L.; Stroman, L.; Thorsell, W. (Dep. Pharmacol., Roy. Vet. Coll., Stockholm, Sweden). **Distribution and fate of the insect repellent ^{14}C-*N,N*-diethyl - *m*-toluamide in the animal body. I. Distribution and excretion after injection into mice.** *Acta Pharmacol. Toxicol.* 37(2): 121-133; 1975. (15 references)

The tissue distribution of ^{14}C-labeled *N,N*-diethyl - *m*-toluamide (DEET), a widely used mosquito repellent, was studied in mice basically by means of whole-body autoradiography. Five male albino mice of the NMRI strain and 2 female mice in advanced pregnancy weighing about 50 g were given 5 μci of ^{14}C-DEET/10 g body weight by slow i.v. injection. The animals were sacrificed at 5 min, 20 min, 1 hr, 4 hr, and 1, 4, and 16 days after injection. After i.v. injection of the substance, high tissue concentrations of radioactivity were found mainly in the liver, kidney, lacrimal gland, and nasal mucosa. At short time intervals after injection, concentrations above the blood level were also seen in the thyroid and brown fat. Quantitative measurements revealed that the highest uptake was present in the lacrimal gland where radioactivity was also retained longer than in other tissues. Rapid excretion of the substance was found to occur mainly through the kidney. Thus, by 4 hr after injection, very little radioactivity remained in all tissues except the lacrimal gland. A placental barrier for the substance was observed, with much lower concentrations in the fetuses of pregnant mice than in the mother.

75-2491. Behrman, J. (Reed and Carnrick, Kenilworth, NJ 07033). **Scabies in babies.** *Am. J. Dis. Child.* 127: 910; 1974.

In an earlier article appearing in this journal, reference was made to treatment of scabies in babies by using gamma benzene hexachloride. While such treatment is fine, an unfortunate typographical error in the original paper calls for too high a concentration of gamma benzene hexachloride. It is important that this

tion be corrected, as use of 10% gamma benzene hexachloride may result in toxicity. The maximum concentration permitted by the FDA is 1%. The article containing the error was written by Dr. Hurwitz and appeared in volume 126:226, 1973.

75-2492. De Lavaur, E.; Grolleau, G.; Siou, G.; Le Sech, J.; Arnold, A. (Lab. Phytopharm., Cent. Natl. Rech. Agron., I.N.R.A., Versailles, France). **Intoxication experimentale de lievres par de la luzerne traitee au paraquat. [Experimental poisoning of hares with paraquat-treated alfalfa.]** *Ann. Zool.-Ecol. Anim.* 5(4): 609-622; 1973. (13 references) (French)

The assessment of poisoning hazards to hares resulting from the treatment of alfalfa with a standard dose of paraquat was undertaken. A few hr after or just before paraquat treatment, the hares were placed on alfalfa plots in order to determine whether the toxic effects of residues left on plants would be reduced by drying. Results showed similar paraquat effects in both cases. Half the experimental population died 72 to 120 hr after the treatment. Emphysema-type lung injuries and an ulceration of the lingual mucous membrane were found in hares which survied and were sacrificed two weeks later. Residues on plants (relative to the fresh weight) were about 30 ppm for alfalfa and 60 ppm for the adventitious graminaceae. Analysis of the hares revealed no paraquat in the organs, except in the caecum, and very low urine concentrations.

75-2493. Skromne-Kadlubik, G.; Ferez, A.; Celis, C. (Lab. Radionuclidos, Fac. Med., U.N.A.M., Mexico). **Atrofia selectiva de la corteza adrenal con dichloroo-difenil-dichloretano I-131 (DDD I-131). [Selective atrophy of adrenal cortex by dichloro-diphenyl dichloroethane I-131 (DDD I-131).]** *Arch. Inst. Cardiol. Mex.* 44(6): 869-873; 1974. (5 references) (Spanish)

The treatment of suprarenal tumors is facilitated by the use of DDD (TDE) in chronic doses which range from six months to a year. Good results have been achieved in treatment with this medication according to adrenal gammagraphy. The experiment reported here tests its effectiveness in producing atrophy of these glands by permitting introduction of high doses of I-131 into the cortex. Twenty mice were given the equivalent of 10,000 rads per gram of adrenal cortex tissue of DDT I-131. Ten rats ("acute" animals) died within 24 hr., and the remainder ("chronic" animals) also received a chloride and parenteral steroid diet for five days. An equivalent control group received identical treatment except for the radioactivity. Autopsy of the "acute" animals revealed marked edema of both adrenals with large amounts of angiomatous hemorrhages covering the surface. Anatomic examination of "chronic" animals, sacrificed at intervals from 6 to 90 days, revealed progressive atrophy limited to the adrenal cortex with no apparent radiation damage to other tissues. Two animals have been kept alive and crossed for genetic evaluation. No control animal revealed any detectable alteration. It is concluded that DDT I-131 has potential as a treatment in humans using dosages proportionate to those of the experimental animals and research should be pursued.

75-2494. Davidek, J.; Seifert, J. (Coll. Chem. Technol., Prague, Czechoslovakia). **Metabolismus organofosforovych insekticidu. [Metabolism of organophosphorus insecticides.]** *Chem. Listy* 68(10): 1010-1026; 1974. (78 references) (Czech)

A review is presented of metabolic reactions of vertebrates, insects, and plants to organophosphorus insecticides based on literature published prior to 1973. General metabolic reactions are divided into 3 groups: activations, i.e., processes which increase the effectiveness of insecticides; degradations, i.e., decomposition into active products; and conjugations, i.e., removal of products from living organisms. Molecular composition formulas and an assessment of effectiveness are presented for the following activation processes: oxidation of thiono-sulfur, sulfidic sulfur, and aliphatic substituents; hydroxylation combined with dealkylation of *N*-alkyl substituents; and dehydrochlorination of trichlorfon. The most common degradation processes are breakdowns of alkoxy and alkoxycarbonyl compounds, cleavage of anhydride structures and amides, decarboxylation, and reductions of nitro compounds. The most effective conjugation processes are the formation of glucuronides in vertebrates and the formation of conjugates with glucose in insects and plants. Detailed molecular diagrams and a discussion of the effectiveness of the metabolic processes are given for the following 10 common organophosphate insecticides; carbophenothion, formothion, mevinphos, diazinon, dimethoate, malathion, thiometon, fenitrothion, methyl parathion, methidathion, trichlorfon, and dichlorvos. A table is included, giving detailed chemical composition of these substances.

75-2495. Sutterlin, A. M. (Environ. Canada, Biol. Stn., St. Andrews, New Brunswick, Canada). **Pollutants and the chemical senses of aquatic animals— perspective and review.** *Chem. Senses Flavor* 1(2): 167-178; 1974. (87 references)

Man-made alteration in the quality of coastal and inland water has subjected aquatic animals to profound changes in both the background level and variety of compounds to which they are exposed. Chemoreceptive membranes, both olfactory and gustatory, have probably evolved a certain degree of compatibility with a wide variety of naturally occurring compounds. Chemoreceptive membranes are directly exposed to the environment and not protected by external barriers or internal complexing or detoxifying systems that protect internal organs from pollutants. It is conceivable that some of the novel compounds in the environment today could interfere with the functioning of these chemoreceptive membranes, causing a breakdown in communication between animals and their environment. Considering that the chemosensory

capabilities of many animals may exceed the sensitivity of analytical instruments used in pollution monitoring, it may be impossible to estimate how seriously detrimental the effect of pollutants on chemoreception and chemical communication may be. This review considers the importance of chemical communication in aquatic animals, the possible types of interactions between pollutants and chemosensory systems resulting in disturbances in behavior patterns, methods used in studying some of these interactions, and a survey of the literature by pollution types. Under the pollution type, pesticides, studies are cited which showed that green sunfish avoided chlordane but not lindane at concentrations close to lethal levels; that fish moved out of an area treated with 2,4-D; that sheephead minnows can avoid DDT, endrin, Dursban and 2,4-D, but can not avoid malathion or Sevin; and that mosquitofish can avoid Dursban, malathion and 2,4-D at comparatively low concentrations. However, while it seems that fish under laboratory conditions avoid some pollutants at sublethal levels, attempts to extend these avoidance levels to field conditions must be done with caution.

75-2496. Dross, K. (Inst. Clin. Pharmacol., Freien Univ., Berlin, Germany). **Effects of di-isopropyl fluorophosphate on the metabolism of choline and phosphatidylcholine in rat brain.** *J. Neurochem.* 24(4): 701-706; 1975. (31 references)

The administration of 2.0 mg diisopropyl fluorophosphate (DFP), s.c., to adult female Wistar rats caused a diminution in the lysophosphatidylcholine content in the brain. This was followed by a decrease of glyceryl phosphorylcholine concentration and by a reduction of post mortem choline increase. These findings support the hypothesis that a post mortem increase in choline is due to phosphatidylcholine breakdown. Since the amount of phosphatidylcholine in the brains of diisopropyl fluorophosphate treated rats increased, it is concluded that phospholipase A is inhibited by diisopropyl fluorophosphate, which corresponds to findings of other researchers. The activity of glyceryl phosphorylcholine diesterase is not altered.

75-2497. Agricultural Chemicals Inspection Station. (Min. Agric. Forest., Kodaira, Tokyo, Japan). [**Recently registered pesticides.**] *Kongetsu No Noyaku (Agric. Chem. Mon.)* 19(8): 64-69; 1975. (Japanese)

Toxicity data for recently registered pesticides is presented. Values were obtained as follows: chlorpyrifos-methyl LD50 p.o. 2254 and 2032 mg/kg for male and female mice, respectively; 2472 and 1824 mg/kg for male and female rat. The dermal LD50 is $\rangle$ 3713 mg/kg for rat and TLm (48 hr) 4.0 ppm for carp. Corresponding values for methyl isoxathion were 416 mg/kg (male mouse p.o.), 363 mg/kg (female mouse p.p.), 1514 mg/kg (male rat p.o.), and 1413 mg/kg (female rat p.o.), 7000 mg/kg and 13.5 ppm (48-hr TLm in carp). For cyprazine (2-chloro - 4 - cyclopropylamino - 6 - iso propylamino - *s* - triazine) the values were 1306 mg/kg (male mouse p.o.), 1056 mg/kg (female mouse p.o.), 516 mg/kg (male rat p.o.), and 516 mg/kg (female rat p.o.), 3000 mg/kg (rat and mouse dermal), and 10-20 ppm for carp. For cypromide, the values were 1330 mg/kg (male mouse p.o.), 1580 mg/kg (female mouse p.o.). 2333 mg/kg (male rat p.o.), and 1860 and 16 mg/kg (female rat p.o.), 4500 mg/kg (rat and mouse dermal), and 3.5 ppm in carp.

75-2498. Yamamoto, T.; Kuroiwa, S. (Sch. Toxicol., Fac. Pharmacy, Showa Univ., Tokyo, Japan). [**The difference of mammalian toxicity of methylparathion and fenitrothion.**] *Nippon Yakurigaku Zasshi (Jpn. J. Pharmacol.)* 71(3): 53P-54P; 1975. (Japanese)

To examine the origin of differences in mammalian acute oral toxicity between fenitrothion (LD50 290 mg/kg, rat) and methyl parathion (LD50 10 mg/kg, rat), both insecticides were administered at 1/10, 1/20, and 1/40 of LD50 values daily for 28 days to male adult rats. After initial depression of ChE activities in liver and serum, both values were quickly recovered. When the same molar amount of the poison was administered (in single doses of 5 μmol/rat and continuous dosages of 0.5 μmol/rat/10 days), the brain ChE activity was not inhibited by single dose administration of fenitrothion, but was inhibited by continuous administration of fenitrothion, and both single and continuous dose administrations of methylparathion. According to these and other experimental results, the differences in toxicity were due to more rapid degradation of fenitrothion than methylparathion in the mammalian body.

75-2499. Muramatsu, M.; Kuriyama, K. (Sch. Pharmacol., Kyoto Pref. Univ. Med., Kyoto, Japan). [**On the effects of organophosphorus compounds on the metabolism of acetylcholine in the brain.**] *Nippon Yakurigaku Zasshi (Jpn. J. Pharmacol.)* 71(4): 102P; 1975. (Japanese)

The effect of parathion and diisopropyl fluorophosphate (DFP) on the synthetic system of acetylcholine was examined, using the brain of a mouse, by determination of choline acetyltransferase and intake of choline. Parathion and DFP showed noncompetitive inhibition of ChEs in homogenate, microsomal, and synaptosomal fractions; the degree of inhibition was greater with DFP than parathion. Parathion noncompetitively inhibited the choline acetyltransferase in homogenate and synaptosomal fraction, though DFP did not affect the choline acetyltransferase. After addition of parathion in amounts inhibiting acetylcholine transferase, lactate dehydrogenase, and malate dehydrogenase were not affected. Parathion showed a 60% inhibition against the intake of ^{14}C-choline by raw mitochondria (P2) fraction, and an equal concentration of DFP showed only a 15% inhibition. Parathion remarkably inhibited ^{14}C-acetylcholine synthesis when the P2 fraction was incubated with ^{14}C-choline. It was concluded that parathion (at more than 1 m*M* in vitro) inhibits acetylcholine synthesis activity in neurons via inhibition of choline acetyltransferase and of choline intake.

75-2500. Kato, Y.; Goto, S. (Inst. Environ. Toxicol., Kodaira, Tokyo, Japan). [**Chemistry and toxicology of ethylenethiourea.**] *Noyaku Kagaku (J. Pestic. Sci.)* 3(1): 1-9; 1975. (27 references) (Japanese)

Formation of ethylenethiourea from ethylenebisdithiocarbamate fungicides in storage formulas, in fields where the fungicides have been applied, and in/on crops to which the fungicides have been applied is reviewed in detail. The decomposition of ethylenethiourea formed by this means is explained. Methods of determining the compound in the fungicide formulation, in soil and in/on crops are discussed. The toxicity of ethylenethiourea (carcinogenicity, teratogenicity, and impairment of thyroid function) is described referring to many reports and results of the author's experiments on teratogenicity, including placental translocation and excretion from the body. Interspecies differences in susceptibility to ethylenethiourea and its relatively short residence time in living organisms are also described.

75-2501. Ishida, M.; Nambu, K. (Nishiki Lab., Kureha Chem. Ind. Co., Ltd., Iwaki, Fukushima, Japan). [**Phthalide (Rabcide).**] *Noyaku Kagaku (J. Pestic. Sci.)* 3(1): 10-26; 1975. (14 references) (Japanese)

The development of phthalide (4,5,6,7-tetrachlorophthalide) as a rice blast control agent, its chemistry, effectiveness, and toxicity are described. The LD50 toxicity values are $\rangle$ 10 g/kg in mouse and rat, p.o.; $\rangle$ 10 g/kg in mouse and rat, s.i.; $\rangle$ 10 g/kg mouse, 9.78 g/kg in male rat, and $\rangle$ 15 g/kg in female rat, i.p. No irritation to eyes and skin was found. The maximum safety level is 2,000 ppm; minimum intoxication is reached at 10,000 ppm; and 50,000 ppm in the daily diet produces definite toxicity. Absorption from the gastrointestinal tract is minimal; identifiable metabolites are tetrachlorophthalic acid, trichlorophthalic acids (in feces and urine), and the open-ring form of 5-methylthio - 4,6,7 - trichlorophthalide. There is no significant accumulation of the parent compound and its metabolites. Toxicity to fish and hens is low; persistence in/on vegetables and soil is minimal. Teratogenicity is negative in rodents. The actual and presumed metabolic fate in mammals, in composts made by applied rice straw, and in soil is described in detail. Starting from the radiolabeled parent compound, intermediates are partially identified.

75-2502. Shitamatsu, A. (Inst. Pestic. Res., Nippon Tokushu Noyaku Co. Hino, Tokyo, Japan). [**On the new insecticide Tokuthion (dichlorpropaphos).**] *Noyaku Kenkyu (Pestic. Res.)* 21(3): 36-42; 1975. (5 references) (Japanese)

General properties of *O*-ethyl, *S*,*n*-propyl *O*-2,4-dichlorophenyl phosphorodithioate (Tokuthion) were introduced. Its mammalian toxicity was determined in mice. The acute oral LD50 is 940 mg/g body weight; acute dermal LD50 is 1650 mg/g body weight. Tokuthion did not stimulate skin or ocular mucosa of laboratory animals. Its toxicity was not synergized with other pesticides.

75-2503. Zdybiewska, M.; Kluczycka, K. (Sanit. Bioeng. Group, Inst. Environ. Protect., Silesian Tech. Univ., Gliwice, Poland). **Comparative studies on the determination of toxicity of some pesticides.** *Pol. Arch. Hydrobiol.* 21(1): 179-190; 1974. (18 references)

The toxicities of three pesticides, the insecticide DDT, the fungicide Cupritox 50, and the herbicide simazine, were determined with the parallel use of the BOD test, the mortality test and Kalabina's method. The two latter methods allowed the determination of the precise toxicity of pesticides, while the BOD test did not always give representative results. The method of determining BOD_{20}, used for Cupritox-50 has made it possible to determine the limit concentration of copper ions which still would not check the process. However, in preparations consuming oxygen, such as the products containing DDT and simazine, the results were not typical, for it was impossible to distinguish the process of immediate oxygen consumption from the simultaneous check of biochemical processes. The determination of toxicity with the use of *Paramaecium caudatum* as index organisms permitted the establishment of the toxic concentration of the particular pesticides and their "safe concentration". The determination of toxicity by Kalabina's method confirmed the results from the use of *Paramaecium caudatum* and, at the same time, since a more complicated biocenose was under observation (samples inoculated with municipal sewage), it suggests that biochemical processes of purification of sewage may be introduced in the presence of the investigated substances, used in appropriate concentration.

75-2504. Sakama, H.; Nishimura, M.; Someya, N.; Ueda, K. (Sch. Hyg., Tokyo Dental Coll., Tokyo, Japan). [**An improved spray inhalation apparatus and inhalation toxicity of organophosphorus pesticides to rats.**] *Proc. 18th Annu. Meet. Jpn. Soc. Ind. Med.*, 1975, p. 68-69. (Japanese)

A newly improved spray inhalation apparatus is described. Male Wistar rats, body weights 110-180 g, were acutely and subacutely exposed to sprayed air containing, respectively, 3030-4890 mg/m^3 fenitrothion or 248-1140 mg/m^3 diethyl 6-oxo-1 - phenyl-1H - pyridazine-3-yl phosphorothionate (pyridafenthion). There were no deaths when fenitrothion was inhaled for one hour, but decreases in plasma and erythrocyte ChE activity were noted. There were no deaths when pyridafenthion was inhaled in the above concentrations for one to six hours. Subacute inhalation at 190 and 280 mg/g^3, one hr/day, 5 days/wk, for 37 days (26 total exposures) caused no deaths; however, decreases of body weight, salivation, nasal hemorrhage, and turbid eyes were observed. At the end of this series of inhalations, pyridafenthion concentrations in blood were 0.020 and 0.065 μg/ml at 190 and 280 mg/m^3, respectively.

75-2505. Cerna, M. (Res. Inst. Dairying, Prague, Czechoslovakia). **Rezidua pesticidu z hlediska technologickeho zpracovani mleka.** [**Pesticide residues from the point of**

view of milk processing technology.] *Prum. Potravin* 25(1): 4-5; 1974. (20 references) (Czech)

Available literature is surveyed for effects of residues of chlorinated hydrocarbon pesticides in milk on various technological processes used by the dairy industry. Pesticide residues generally prolong the coagulation process and inhibit the growth of such bacteria as *S. lactis, S. thermophilus* and *L. bulgaricus* during fermentation processes used in manufacture of cheeses and yogurt. Very low concentrations of residues (0.1 to 10 ppm) sometimes aid the fermentation. Microorganisms such as *A. aerogenes, E. coli,* and *B. cereus* can change chlorinated hydrocarbon residues into less harmful compounds, e.g., DDT to DDD (TDE). These conversions, however, are not very significant. Most pesticide residues are contained in fat-fraction and can be effectively removed with fat. Milk condensation, sterilization and drying (powdering) processes which require high temperatures can significantly decrease the level of residues of such pesticides as DDT, lindane, dieldrin, heptachlor, heptachlor epoxide and others. Generally residues are very stable compounds and difficult to remove.

75-2506. Petescu, S.; Dobre, V.; Leibovici, M.; Petrescu, Z.; Ghelberg, S. A. (Inst. Med. Farm., Iasi, Romania). **Cercetari privind effectele administrarii prelungite a unor substante pesticide organoclorate (lindan, DDT), asupra sobolanului alb de laborator. [The effects of long term administration of organochlorine pesticides (lindane, DDT) on the white rat.]** *Rev. Med. Chir.* 78(4): 831-842; 1974. (25 references) (Romanian)

Investigations on the effect of long term administration of lindane and DDT (1-2 yr) between 1966 and 1970 are presented. Doses of 5, 10, and 15 mg/kg body weight were added to the food of white rats over four generations (P, F_1, F_2, F_3). Organochlorine pesticides (DDT) have a minimal effect on body weight when administered by the alimentary route. For the first 30 days, ascorbinemia increases slightly, then steadily decreases for 100 days. Next, there is a return to normal values which suggests AA (ascorbic acid) synthesis and the possible involvement of AA in mechanisms of adaptation for defense against damage due to pesticides. Hematopoiesis in the animals is not affected by lindane or DDT. Prolonged lindane administration affects female gonads, thus lengthening the prepuberal period in direct relation to the generation, and the estrous cycle, in F_2 and F_3 adults is prolonged. Because of this, the fertility index is lowered and pregnancy is lengthened by 1-2 days. The mortality rate approaches 100% in direct relation with the generation of the treated animals. Urinary 17-ketosteroid elimination, induced by lindane, indicates adrenocortex involvement in adaptation. Lindane has a teratogenic effect on F_1 subjects (double monsters, cranioschisis, anophthalmia, etc.). Carcinogenic effects in F_1 (4.4%) and F_2 (0.84%) included a morphologic diagnosis of mammary adenofibroma in one case and two fibrosarcomas. Long term administration of large amounts of lindane (15 mg/kg body weight) affects the central nervous system, producing spastic paraplegia in 13.46-14.28% of F_1 and F_2 cases.

75-2507. Fisher, N. S. (Woods Hole Oceanogr. Inst., Woods Hole, MA 02543). **Chlorinated hydrocarbon pollutants and photosynthesis of marine phytoplankton: a reassessment.** *Science* 189(4201): 463-464; 1975. (17 references)

The chlorinated hydrocarbons DDT and PCBs (polychlorinated biphenyls), ubiquitous pollutants of the marine environment, have been observed to reduce the cell division rate of marine phytoplankton, thereby indirectly reducing the total photosynthetic carbon fixation in treated cultures. The photosynthetic capacity of each cell was not affected. Total marine photosynthesis will likely remain undiminished by these compounds, although alterations in phytoplankton communities through selective toxicity could affect herbivore populations. (Author abstract by permission. Copyright 1975 by the American Association for the Advancement of Sciene)

75-2508. Brzheskii, V. V. (All-Union Sci.-Res. Inst. Disinfect. Steril., Min. Health USSR, Moscow, USSR). **The study of the mutagenic properties of an insecticide from the carbamate group—sevin.** *Sov. Genet.* 8(6): 798-800; 1972. (5 references)

The mutagenic action of carbaryl was investigated in several lines of *Drosophila melanogaster:* the normal line D-32; a laboratory line with linked X-chromosomes, homozygous with respect to three recessive genes, y, w, and f; and the line with sc-si-w-a In Ssc^s (Meller 5). In an examination of 7089 offspring (F_1) of carbaryl treated (85% solution) males, no deletions were detected, nor were any changes in fertility noted. The frequency of mutation arising under the influence of a 1% suspension of carbaryl on individual stages of spermatogenesis did not differ significantly from that in the control, but statistically significant differences were obtained ($0.20 \pm 0.07\%$; $td = 2.85$). It is concluded that carbaryl is a very weak mutagen. Although no significant differences were detected in the mutation frequency at different stages of spermatogenesis, a certain tendency for an increase in the mutation frequency was noted in the spermatocytes. More than half of the mutations obtained proved to be partial.

75-2509. Rosa, N.; Cheng, H. H. (Agric. Can., Res. Stn., Delhi, Ontario, Canada). **The effect of soil composition and length of exposure to DDT on uptake by tobacco.** *Tob. Sci.* 19: 71-74; 1974. (8 references)

The distribution of radioactive DDT within greenhouse tobacco (*Nicotiana tobacum* L.) plants grown for a short period in nutrient solution and in mixtures of quartz sand (sand) and field soil (soil) was compared with plants grown for a longer period in soil. The DDT content of roots exceeded 83% of the total DDT taken up from the media. These proportions were not affected by the media

to any great extent. The major difference was the total DDT in the plant as affected by the medium. Increased proportion of soil in a sand soil mixture resulted in a decreased amount of DDT in the roots. Roots from soil-grown plants contained approximately half the amount of DDT present in roots of plants grown in sand. The amount of DDT uptake decreased with an increasing proportion of soil in the sand-soil mixtures. The inactivation of DDT may relate to the amount of soil organic matter. Approximately 20 mg of DDT/plant was required before plant uptake paralleled that from nutrient solution. The amount of DDT retained on different particle diameters of soil indicated that coarse sand, very fine sand, and coarse silt contained a higher percentage of DDT on an equivalent weight basis than did the medium and fine sand categories. The results indicate that binding sites on the soil had to be saturated before the DDT was available for plant uptake and would agree with the observed decrease of DDT uptake by plants grown in increasing amounts of soil in the sand soil mixtures.

75-2510. Pekas, J. C. (Agric. Res. Serv., Metab. Radiat. Res. Serv., Fargo, ND 58102). **Naphthol metabolism: glucuronide conjugation and transport by the rat intestine in vitro.** *Toxicol. Appl. Pharmacol.* 29(3): 404-419; 1974. (15 references)

[^{14}C]Naphthol was converted to water-soluble ^{14}C-labeled metabolites by everted sacs of rat small intestine. The extent of conversion to metabolites and release to the bathing medium was greater for sacs from cranial (80%) than for sacs from caudal (60%) small intestine. The concentration of metabolites was always greater in serosal than in mucosal fluids. This concentration gradient increased from the cranial to the caudal end of the intestine. Net ^{14}C transport to the serosal fluid was entirely as metabolites and was associated with the volume of water transported. The principal metabolites were glucuronide conjugates of naphthol which were hydrolyzed by β-D-glucuronide. Naphthol-β-D-glucuronide appeared to be the principal metabolite in the recovered mucosal and serosal fluids and tissues. The quantities of metabolites synthesized by sacs from the various regions of the intestine were not notably different when either pH 7.4 or pH 6.5 medium was used. The tissue concentration of ^{14}C and quantity of metabolite transferred to serosal fluid in the pH 7.4 and pH 6.5 media were slightly different. The mechanism for the apparent uphill transport of metabolites was not apparent. The results have been compared to those from previous investigations where [^{14}C-naphthyl]*N* - methylcarbamate (carbaryl) was studied and provide greater insight into the intestinal metabolism of this naphthol-containing pesticide. (Author abstract by permission)

75-2511. Harbison, R. D. (Dep. Pharmacol. and Cent. Toxicol., Dep. Biochem., Vanderbilt Med. Cent., Nashville, TN 37232). **Parathion-induced toxicity and phenobarbital-induced protection against parathion during prenatal development.** *Toxicol. Appl. Pharmacol.* 32(3): 482-493; 1975. (24 references)

Parathion was embryocidal or fetocidal when administered to pregnant mice. Parathion, 12 mg/kg, administered on days 12, 13, and 14 of gestation produced about 90% incidence of deaths in utero when administered on gestational days 8, 9, and 10. Parathion also significantly reduced fetal body weight. Again, there was a gestational period susceptibility. Phenobarbital pretreatment completely protects the fetus against the lethal actions of parathion. Following intraperitoneal administration of (^{14}C)parathion, ^{14}C was measured in maternal and fetal tissue. Plasma disappearance of ^{14}C was significantly enhanced by phenobarbital treatment. Similarly, concentrations of ^{14}C measured in maternal liver, fat, and muscle were significantly decreased by phenobarbial pretreatment. Parathion was transferred across the placenta and was measured in fetal tissue. Again, the peak of concentration of ^{14}C measured was reduced and the disappearance from fetal tissue significantly enhanced by phenobarbital pretreatment. The passage of paraoxon into fetal tissue was prevented and inhibition of fetal cholinesterase was blocked by phenobarbital pretreatment. Thus, the fetus was protected against lethal concentrations of paraoxon by phenobarbital treatment of the maternal animal. (Author abstract by permission)

75-2512. Hayes, J. R.; Hartgrove, R. W.; Hundley, S. G.; Campbell, T. C.; Webb, R. E. (Dep. Biochem. and Nutr., Virginia Polytech. Inst. and State Univ., Blacksburg, VA 24061). **Interaction of endrin and dieldrin with hepatic microsomal cytochrome P-450 from the rat, mouse, and endrin-susceptible and resistant pine voles.** *Toxicol. Appl. Pharmacol.* 32(3): 559-565; 1975. (34 references)

Studies were undertaken to determine whether binding of endrin and dieldrin to hepatic microsomal cytochrome P-450 was related to the pesticide resistance phenomenon demonstrated in two strains of pine voles. Both endrin and dieldrin produce type I spectral changes upon interaction with cytochrome P-450 in both strains of vole as well as in the rat and the mouse. The *Ks* or ΔA max/nmol P-450 for the binding of both endrin and dieldrin to vole cytochrome P-450 did not differ for these two strains of vole which were shown to differ in their resistance to these pesticides. The differences in endrin toxicity in the vole do not appear to be related to its interaction with cytochrome P-450 at the type I binding site. (Author abstract by permission)

75-2513. Street, J. C.; Sharma, R. P. (Toxicol. Program, Utah State Univ., Logan, UT 84322). **Alteration of induced cellular and humoral immune responses by pesticides and chemicals of environmental concern: quantitative studies of immunosuppression by DDT, Aroclor 1254, carbaryl, carbofuran, and methylparathion.** *Toxicol. Appl. Pharmacol.* 32(3): 587-602; 1975. (23 references)

Dose-dependent, immunosuppressive effects of continued dietary treatment of rabbits with DDT, Aroclor 1254, carbaryl, carbofuran, and methylparathion were studied. The animals were given a diet containing graded amounts of chemicals for 4 wk and challenged with sheep red blood cells and Freund's adjuvant. The testing followed for an additional 4 wk while the animals were maintained on the same diets as before. The most sensitive indication of immunosuppression was based on evaluation of lymphatic organs, primarily those dependent on thymus-derived lymphocytes. The chemical treatments resulted in a decreased count of plasma cells in popliteal lymph nodes (except with carbaryl), reduction of germinal centers in the spleen, and increasing atrophy of thymus cortex. These responses were generally scaled to increasing levels of the compounds tested. Hemolysin and hemagglutinin titers were not significantly affected by any of the chemical treatments nor were consistent trends observed. The antigen-induced increase in serum γ-globulin was consistently decreased with DDT, Aroclor, carbaryl, and carbofuran treatments, but only carbaryl produced significant changes (at 10 days postantigen). DDT groups showed significantly higher preantigen γ-globulin values which were less evident following antigen challenge. Skin sensitivity to tuberculin was decreased (except with carbaryl) but generally only at high dosages of the test chemicals. None of the compounds showed any effect on growth, food consumption, leucocyte count, or on organ to body weight ratios for liver, kidney, spleen, and adrenal, except for slight liver enlargement caused by Aroclor 1254. (Author abstract by permission)

75-2514. Kohli, K. K.; Venkitasubramanian, T. A. (Dep. Biochem., Vallabhbhai Patel Chest Inst., Univ. Delhi, Delhi, India). **Dieldrin toxicity and in vivo incorporation of DL-(1-^{14}C)leucine.** *Toxicology* 4(3): 355-362; 1975. (27 references)

The in vivo effect of a single oral dose (30 mg/kg) of dieldrin on the proteolipid and phosphatidopeptide content of the liver and brain and on the total protein content of the liver, brain, plasma, muscle, and kidney was studied in male Wistar rats. The incorporation of (^{14}C)leucine into the total liver protein was increased by the pesticide treatment, while its incorporation into the total muscle protein was decreased and its incorporation into the total protein of all other tissues studied was unchanged. The incorporation of label into the liver phosphatidopeptides was increased, which is consistent with an involvement of these compounds in increasing protein synthesis in the dieldrin-treated rats. The proteolipid protein content of the brain was also increased, while that of the liver was unchanged; there was no change in the labeling of the brain or liver proteolipids.

75-2515. Jovic, R. (Ind.-Med. Protect. Inst., Div. Pharmacol. Toxicol., Yugoslavia). **Prilog poznavanju mehanizma hipotermickog dejstva nekih organofosfornih jedinjenja.** [**Data on the mechanism of hypothermal action exerted by certain organophosphorus compounds.**] *Vojnosanit. Pregl.* 30(1): 8-14; 1973. (17 references) (Serbo-Croatian)

Sublethal doses of the organophosphorus compounds soman, medemo-3 (ethoxy - 2 -diethylaminoethyl thiomethylphosphine), and armine (ethylethoxy - *p* - nitrophenyl phosphonate) administered to white male Wistar rats, body weight 250 g, caused a drop of 2-6° in body temperature, hyperglycemia (130-370 mg%), high inhibition (65-78%) of cholinesterase, and reduced oxygen consumption (18-58%) in vivo and in vitro. With the exception of ChE inhibition, all the above disturbances were reversible within 4-8 hours following intoxication. The mechanism of hypothermia is discussed.

75-2516. Weeraratna, C. S. (Dep. Agric. Chem., Univ. Ceylon, Ceylon). **Biologically active compounds and the soil.** *World Crops* 26(4): 165-166; 1974. (28 references)

Soil microorganisms are important in maintaining the soil fertility. These organisms are responsible for the decomposition of complex organic compounds that are continually incorporated into the soil. The incorporation of biologically active compounds influences the number of soil microorganisms and some of the processes these organisms control. The composition of the microbial population may be altered for several reasons: the compound introduced may be a source of food for some organism, causing its numbers to increase; the same compound may be toxic to another, causing its numbers to decrease and thereby allowing other species to grow due to reduced interspecies competition. Biologically active compounds such as herbicides directly influence the growth of susceptible plants. Other active compounds do not directly affect the plant growth, but may indirectly influence plant growth due to their influence on soil microbial populations. A reduction in the activity of manganese-reducing organisms in the soil, for example, makes the soil manganese deficient, affecting the growth of certain crops. When a biologically active compound enters the soil it undergoes physical and chemical changes. Two theories, the theory of chance mutation and the theory of induction, have been suggested to explain the mechanism by which microorganisms develop the capacity to decompose a biologically active compound. In the former theory, organisms capable of breaking down biologically active compounds are developed by chance mutation. In the second theory, it is the very presence of the biologically active compound which induces microorganisms to secrete enzymes capable of digesting the compound. Usually a lag period follows the incorporation of the compound in the soil, the duration of this period depending on the soil and the type of compound.

75-2517. Johnson, D. D. Lowndes, H. E. (Dep. Pharmacol., Coll. Med., Univ. Saskatchewan, Saskatoon, Canada). **Reduction by diazepam of repetitive electrical ac-**

tivity and toxicity resulting from soman. *Eur. J. Pharmacol.* 28(2): 245-250; 1974. (25 references)

The effects of diazepam on the repetitive electrical activity, convulsions, and death produced by soman were studied in vivo in rats and adult New Zealand rabbits. Soman produced potentiation of twitch tension in rat anterior tibial and phrenic nerve-diaphragm preparations by initiating repetitive electrical activity in the vicinity of the motor nerve terminals. Pretreatment with diazepam abolished this repetitive electrical activity and hence the associated potentiation of muscle twitch tension. These effects were produced by concentrations of diazepam which were without other apparent effects on neuromuscular transmission, as indicated by the absence of effect on normal twitch responses. The combination of diazepam and atropine provided additional protection against soman convulsions and death in rabbits. The results suggest that the protective effects of diazepam in organophosphate toxicity may be the result of its anticonvulsive action.

75-2518. Stenger, R. J.; Porway, M.; Johnson, E. A.; Datta, R. K. (Dep. Pathol., Beth Israel Med. Cent., New York, NY 10003). **Effects of chlordane pretreatment on the hepatotoxicity of carbon tetrachloride.** *Exp. Mol. Pathol.* 23(1): 144-153; 1975. (36 references)

Chlordane (25 mg/kg) was injected i.p. into male Holtzman rats on 3 consecutive days. Twenty-four hr after the last dose, augmented hepatic drug-metabolizing enzyme activity was reflected *in vivo* by a reduction in zoxazolamine paralysis time and was indicated *in vitro* by an increase in liver microsomal cytochrome P-450. There was no increase in the hepatic microsomal activity level of NADPH-cytochrome c reductase. Electron microscopy revealed extensive proliferation of the smooth endoplasmic reticulum in the hepatocytes, particularly in those located in the central 1/3-1/2 of the liver lobules. When the chlordane-treated rats were challenged i.p. with carbon tetrachloride (0.5 ml of a 25% solution in olive oil), there was a sharp drop in the hepatic microsomal cytochrome P-450 after 4 hr but no change in the NADPH-cytochrome c reductase compared with prechallenge levels. Histologic examination after 48 hr indicated that chlordane pretreatment increased the degree of hepatocellular necrosis induced by CCl_4. It is concluded that chlordane can induce smooth-membrane proliferation and that it can enhance drug-metabolizing enzyme systems in the rat liver; these changes appear to be associated with an enhanced hepatotoxic response to CCl_4. It is further suggested that a sharp fall in hepatic microsomal cytochrome P-450 might serve as a relatively early indicator of toxic injury in the induced liver.

75-2519. Moroi, K.; Satoh, T. (Res. Inst. Chemobiodynamics, Chiba Univ., Narashino, Chiba, Japan). **Modification of procaine metabolism in rat liver after administration of phenobarbital or ethyl *p*-nitrophenyl phenylphosphonothioate.** *Biochem. Pharmacol.* 24(15): 1436-1438; 1975. (11 references)

The effects of phenobarbital and ethyl *p*-nitrophenyl phenylphosphonothioate (EPN) on procaine metabolism were studied in adult male Wistar rats. Procaine hydrochloride was injected i.p. (100 mg/kg) into previously untreated animals (controls) and animals which had been pretreated with EPN (5 mg/kg, p.o. 2 hr before procaine) or phenobarbital (80 mg/kg, i.p. daily for 4 days). The liver amidase activity was elevated above control values in the phenobarbital treated rats and significantly inhibited in the EPN-treated rats. After 10 min, the procaine concentrations in the liver and kidney were elevated above control values and the PABA values were reduced in both tissues in the EPN-treated animals. Phenobarbital, on the other hand, increased the liver PABA concentrations and decreased the kidney procaine concentrations; the liver procaine and kidney PABA concentrations did not differ significantly from control values.

75-2520. Sharma, L. N.; Saxena, S. N. (Rajasthan Coll. Agr., Udaipur, Rajasthan, India). **Influence of 2,4-D on soil microorganisms with special reference to *Azotobacter*.** *J. Indian Soc. Soil Sci.* 22(2): 168-171; 1974. (11 references)

The sodium salt of 2,4-D (0, 1.5, 3.0, 4.5, 6.0, and 7.5 ppm) was applied with three replications to clay loam soil in plastic pots. After the last application, the soil samples were inoculated with *Azotobacter chroococcum* strain-41. Plating for *Azotobacter*, total bacteria, fungi, and actinomycetes was performed on the second, eighth, fourteenth, twentieth, twenty-sixth, and thirty-second days after treatment. 2,4-D treatment increased the numbers of fungi, *Azotobacter*, and total bacteria up to the second, fourteenth, and thirty-second days, respectively; the effect increased with increasing concentrations up to 4.5 ppm. A dose-dependent decrease in the numbers of actinomycetes was seen up to the twentieth day. At levels greater than 4.5 ppm, 2,4-D was toxic to all organisms studied. In low concentrations, 2,4-D stimulated the *Azotobacter*, bacterial, and fungal populations by a direct hormonal effect and indirectly by suppression of the soil actinomycetes.

75-2521. Dittrich, V.; Ghobrial, A. (Ciba-Geigy Agrochem. Div., Basel, Switzerland). **Dynamics of resistance to acaricides in two mite species, *Tetranychus arabicus* Attiah and *T. cucurbitacearum* Sayed, occurring on Egyptian cotton.** *Z. Angew. Entomol.* 76(4): 418-429; 1974. (15 references)

Eight local races of two species of spider mites (*Tetranychus arabicus* Attiah and *T. cucurbitacearum* Sayed) occurring on Egyptian cotton were monitored over a 3-yr period for their resistance to acaricides. On the basis of LC50 determinations using the slide-dip method, *T. arabicus* (green) appeared strongly resistant to dicofol, methyl parathion, and chlordimeform; although the LD50 values for vamidothion were high, there was no apparent trend toward increasing resistance to this compound. Similar results were obtained with *T. cucurbitacearum* (red),

although the LD50 values were lower in this species. With most of the compounds studied there was a tendency toward low LC50 values in the spring and high values in the autumn; this trend was reversed with chlordimeform. The results indicate the independence of chlordimeform action from known resistance mechanisms, and suggest a negative correlation with such mechanisms.

75-2522. Hummon, W. D. (Dep. Zool. Microbiol., Ohio Univ., Athens, OH 45701). **Effects of DDT on longevity and reproductive rate in *Lepidodermella squammata* (Gastrotricha, Chaetonotida).** *Am. Midland Naturalist* 92(2): 327-339; 1974. (32 references)

Demographic life history data were used to assess the effects of increasing concentrations of DDT on the longevity and reproductive rate of *Lepidodermella squammata*, a common aquatic micrometazoan. These obligate parthenogens were cultured individually in slide depressions, each juvenile being transferred to its own depression upon hatching. The culture solutions in the depressions contained 0, 0.05, 0.5, 5.0, and 50 ppm DDT. Life history data were collected at 0.5-day intervals for 57-69 individuals cultured under each condition; the data was then assembled into life tables. Mean life expectancy, intrinsic rate of natural population increase, and net reproductive rate per individual lifetime all decreased with increasing DDT concentration. Even at 0.05 ppm DDT, a concentration too low to allow detection using data from lethal concentration tests, the intrinsic rate of natural increase showed a 10% selective disadvantage associated with DDT exposure. While the same general relationships would be expected to occur in the field, mortality resulting from a pollutant would largely be masked under field conditions by mortality from other causes.

75-2523. Kocisova, J.; Sram, R. J. (Inst. Hygiene Epidemiol., Prague, Czechoslovakia). **Effect of simultaneous administration of antibiotics and TEPA on the realization of potential chromosome breaks as translocation in *Drosophila melanogaster*.** *Folia Biol.* 20(5): 325-332; 1974. (17 references)

The effects of TEPA combined with chloramphenicol (CHF), puromycin (PU), or rifampicin (RIF) on the storage effect (an increase in the frequency of chromosomal aberrations with storing) was studied in *Drosophila melanogaster*. Sex-linked lethals were determined by the Muller-5 test, and the storage effect was examined in terms of changes in translocation frequency during storage of mutagen-treated spermatozoa in fertilized females. Translocation frequency was increased 11-22 days after TEPA treatment alone, but was reduced at 11-13 days and remained unchanged up to 22 days after treatment with TEPA plus CHF. Translocation frequency was significantly reduced by TEPA in combination with PU or RIF. In the sex-linked recessive lethal test, CFH in combination with TEPA increased the mutation frequency over that seen with TEPA alone, while PU and RIF in combination with TEPA had no effect. The effects of PU and RIF in combination with TEPA are inhibitory effects of the antibiotics on the fixation of mutations which are manifested as chromosome breaks.

75-2524. Smith, A. E.; Wilkinson, R. E. (Univ. Georgia Coll. Agr. Exp. Stn., Experiment, GA 30212). **Differential absorption, translocation and metabolism of metribuzin (4-amino-6-tert-butyl-3-(methylthio)-as-triazine-5 (4H) one) by soybean cultivars.** *Physiol. Plant.* 32(3): 253-257; 1974. (17 references)

'Bragg', 'Coker 102', and 'Semmes' soybeans were grown in sand subirrigated with a nutrient solution containing ^{14}C-carbonyl metribuzin and nonlabeled metribuzin (both at 1 x 10^{6} M) to determine cultivar variability in the absorption, translocation, and metabolism of metribuzin. The plants were harvested periodically, autoradiographed, and the radioactivity in the tissue extracts quantified. The results indicated that all three cultivars readily absorbed and translocated the metribuzin. However, the 'Bragg' tissues accumulated greater quantities of metribuzin metabolites than did the tissues of the other cultivars. The major radioactive metabolite in the 'Semmes' and 'Coker' roots and stems was 6-*tert*-butyl-*as*-triazine-3,5-(2H,4H)-dione, whereas the major radioactive metabolite in the 'Bragg' roots and stems was a glucose conjugate. The data indicates that differential intraspecific responses to metribuzin may result from variations in the capacity for herbicide detoxification by conjugation.

75-2525. Dinamarca, M. L.; Ramirez, A.; Valdes, E.; Poblete, P. (Dep. Biochem., Fac. Med., Santiago Norte, Univ. Chile, Santiago, Chile). **DDT-dehydrochlorinase - V. The effect of phospholipases and phospholipids on DDT-dehydrochlorinase.** *Int. J. Biochem.* 6(6): 413-422; 1975. (27 references)

DDT-dehydrochlorinase (DDTase) was purified from a DDT-resistant strain of housefly and the role of its phospholipid moiety in its enzyme activity was studied using phospholipases A, C, and D. Treatment of the lipoprotein enzyme with phospholipase A resulted in an apparent inhibition of the dehydrochlorination activity of DDTase. This effect was eliminated by removal of the fatty acids produced by the lipase. A stimulation of activity was observed on the addition of total phospholipid from flies, even in the presence of the liberated fatty acids. Phospholipase C-induced removal of the phosphorus compounds present in the DDTase completely inhibited its DDT-dehydrochlorination activity. The soluble products of the phospholipase treatment had no effect on the inactivation or subsequent reactivation by phospholipid. Phosphatidylcholine and phosphatidylserine obtained from the same houseflies were the most effective reactivators of the phospholipase C-treated DDTase; phosphatidylethanolamine was ineffective in this respect. Treatment of DDTase with phospholipase D was accompanied by an increase in acid-soluble choline, with no

apparent loss of DDT-dehydrochlorination activity. GSH oxidation activity of the DDTase was not affected by any of the phospholipase treatments. It is suggested that the hydrophilic groups of the readily separated DDTase phospholipids must remain in position within the molecule for maximum DDT-dehydrochlorination activity.

75-2526. Rosic, N.; Vojvodic, V.; Vojvodic, M. (Dep. Pharmacol. Toxicol., Inst. Tec. Med. Protect., Beograd, Yugoslavia). **The protective effects of some tertiary and quaternary antimuscarinic drugs and oxime in rats poisoned by lethal doses of methylethoxy-(2-dimethyl-amino ethylthio)-phosphine oxide.** *Arh. Hig. Rada Toksikol.* 25(4): 417-421; 1974. (8 references)

Male albino rats were treated s.c. with various multiples of the LD50 of the organophosphorous anticholinesterase compound 33SN (methylethoxy - (2-dimethylaminoethylthio) - phosphine oxide). Ten min later, they were treated i.p. with atropine sulfate (5-25 mg/kg), 3-quinuclidynil benzilate (BZ, 5-10 mg/kg), atropine methylnitrate (5-10 mg/kg), methyl-BZ (2.5-10 mg/kg), and/or N′N′-trimethylene-bis (pyridinium - 4 - aldoxime)-chloride (TMB4, 10 mg/kg). In combination with TMB4, both atropine sulfate and BZ afforded a high degree of protection against the toxic effects of 33SN, even when the latter was given in doses as high as 50 times the LD50. Given alone, neither atropine sulfate nor BZ offered much protection. The quaternary compounds were markedly less effective in protecting against the toxic effects of 33SN, even when they were given in combination with the oxime. The results suggest that the central actions of the antimuscarinic drugs are more important in protecting against the organophosphorus poisoning than are their peripheral actions.

75-2527. El-Sawy, M.; Kodeira, K.; Said, K.; Hussein, Z. H. (Pharmacol. Dep., Fac. Med., Ain Shams Univ., Cairo, Egypt). **Experimental studies on potential inducers of microsomal enzymes. II. Effect of DDT and nikethamide on the LD50 of lidocaine in mice.** *Ain Shams Med. J.* 23(1): 83-87; 1972. (16 references)

Lidocaine toxicity was studied in mice pretreated with DDT or nikethamide. DDT was administered in the diet at 50 ppm for 3 days or at 100 ppm for 6 or 12 days. Nikethamide was injected i.p. at 1.0 mg/mouse for 3, 6, or 12 days. The LD50 of lidocaine was determined at the end of the various treatment regimes. DDT pretreatment increased the LD50 of lidocaine in a dose-dependent fashion. Nikethamide pretreatment had a similar but more pronounced effect on lidocaine toxicity. The effects of DDT and nikethamide were probably due to increased activity of the liver microsomal drug-metabolizing enzyme, which accelerated the metabolism of lidocaine. The widespread use of such insecticides may reduce the therapeutic effects of some drugs and lead to undue tolerances.

75-2528. Glogowski, K.; Welter, M.; Czaplicki, E.; Witkowski, W. (Inst. Ochr. Rosl., Poznan, Poland). **Badania nad dynamika Zanikania pozostalosci fentionu u jablkach, sliwkach i czeresniach. [Investigations on the dynamics of degradation of fenthion residues in apples, plums and cherries.]** *Biul. Inst. Ochr. Rosl.* 54: 373-385; 1972. (21 references) (Polish)

The dynamics of fenthion residue degradation in apples, plums and cherries after the application of Lebaycid "Bayer" for the control of codling moth (*Carpocapsa pomonella* L.), plum fruit moth (*Laspeyresia funebrana* Tr.), and cherry fruit fly (*Rhagoletis cerasi* L.) were investigated from 1969-1971. Two state orchards in the districts of Gniezno and Pleszew were chemically treated. Degradation of fenthion residues in the fruits was studied by gas chromatography, with the gas chromatograph produced by PYE, series 104. The sensitivity of this method was 0.05 ppm. Fenthion residues in apples, shortly after orchard spraying, averaged from 5.32 to 15.11 ppm; after 14 days, 0.11-1.55 ppm; and after 21 days, below 1 ppm. Afterwards, levels decreased to the sensitivity limit. Residues in plums, shortly after spraying, averaged 7.11 to 10.85 ppm; after 10 days, below 1 ppm, decreasing to the limit of sensitivity. Residues in cherries shortly after spraying in both years averaged approximately 19 ppm; in 1970 after 21 days they decreased to 0.35 ppm; in 1971 they decreased to 0.70 ppm. According to FAO/WHO recommendations, lebaycid can be applied in apple and plum orchards, fixing the withholding periods to 14 days, and in cherry orchards there is a withholding period of 21 days.

See also **75-2339** **75-2396** **75-2550**

75-2529. Visweswriah, K.; Jayaram, M. (Cent. Food Technol. Res. Inst., Mysore, India). **Colorimetric method for the estimation of malathion.** *Agric. Biol. Chem. (Tokyo)* 38(10): 2031-2033; 1974. (5 references)

Studies were conducted to investigate a method of malathion analysis. The data obtained by this method was compared with the standard Norris method. Malathion in methanolic solution developed a bright yellow color when palladium chloride solution dissolved in hydrochloric acid was added to it. The color gradually deepened, reaching a maximum intensity 10 min after mixing. When this colored complex was scanned through different wavelengths in the visible region using Spectronic-20, it had maximum absorption at 460 nm. The complex obeyed Beer's law in the range of 20 to 240 μg. The yellow colored complex was stable up to 4 hr. As in the Norris method, it is palladium forming a metallic complex with dimethyl dithiophosphoric acid which is responsible for the yellow color. Using the standardized procedure, malathion content was checked in known samples and the accuracy was about ±1.5%. This method and the Norris method gave comparable values. Malathion content in insecticide formulations and as a residue in food grains can be determined by the present procedure with ease and savings in reagents and manipulations.

75-2530. Kovac, J.; Batora, V.; Hankova, A.; Szokolay, A. (Res. Inst. Agrochem. Technol., Bratislava, Czechoslovakia). **Cleanup of extracts using sweep co-distillation adapted to gas chromatograph.** *Bull. Environ. Contam. Toxicol.* 13(6): 692-697; 1975. (2 references)

A new sweep co-distillation cleanup procedure for extracts of plants treated with organophosphorus pesticide compounds is described. Milk, gourds, kale, carrots, sugar beet tops, cauliflower, tomatoes, lettuce, apples, plums, and pears were extracted and fortified with a mixture of diazinon, fenitrothion, malathion, and trichloronat at total levels of 0.25 and 5.0 ppm. The extracts were injected with ethyl acetate into modified Storherr tubes packed with Pyrex glass wool and heated to 185°C under a nitrogen flow of 600 ml/min. The distillate was concentrated and the residue levels were determined using a glass chromatograph detector oven with a cesium thermionic detector. Pesticide recovery from all but the plum extracts was satisfactory. Since about 5% of the residues were held back by the modified Storherr tube packing, new Storherr tubes were required for each analysis. The technique proved rapid, versatile, and inexpensive. When combined with thin layer chromatography, it should be especially suitable for screening samples with unknown histories of chemical treatment.

75-2531. Greenhalgh, R.; Kovacicova, J. (Chem. Biol. Res. Inst., Agric. Canada, Ottawa, Ontario, Canada). **Confirmation of atrazine and fenuron by alkylation at the ppm level.** *Bull. Environ. Contam. Toxicol.* 14(1): 47-48; 1975. (4 references)

Atrazine or fenuron in hexane (1 ml, concentration 2 μg/ml) was added to sodium hydride in a screwcapped tube, followed by dimethyl sulfoxide (0.1 ml) and methyl iodide (0.1 ml). The solution was heated at 50°C for 10 min, 1 ml water added, the hexane layer removed, and the solution extracted twice with hexane. The extracts were analyzed by gas chromatography. Alkylation of atrazine yielded dimethyl atrazine in a yield of 86%. Alkylation of fenuron yielded methyl fenuron. The results indicate that alkylation with sodium hydride/methyl iodide/dimethyl sulfoxide gives derivatives of atrazine and fenuron which can be used to confirm their identity at the ppm level. This method should be applicable to other triazine and urea herbicides.

75-2532. Wright, S. J. L. (Sch. Biol. Sci., Univ. Bath, Bath, England). **A simple agar plate method, using microalgae, for herbicide bio-assay or detection.** *Bull Environ. Contam. Toxicol.* 14(1): 65-70; 1975. (8 references)

A simple, inexpensive method is described for the bioassay of herbicides using micro-algae growing on agar plates. Late exponential phase cultures of the green algae *Chlorella* and *Pleurococcus* sp. were inoculated onto agar plates. Herbicide impregnated Antibiotic Assay Discs were air dried and placed on the inoculated agar surface. The plates were incubated at room temperature underneath white fluorescent strip lights. Both algal species formed dense mats of growth in 2-3 days with clear zones around the discs showing the extent of growth inhibition. With *Chlorella*, the greatest growth inhibition was obtained with barban (carbyne), followed by chlorpropham, then propham. This species was also markedly sensitive to the triazine herbicide cyanazine, and less sensitive to monuron and fenuron. Aniline and 3-chloroaniline did not inhibit the growth of this alga. With each of the phenylamide herbicides tested, *Chlorella* was more sensitive than *Pleurococcus*, particularly in the case of barban. The inhibition of algal growth appeared to parallel the order of relative phytotoxicity. This method is suitable for the biodetection of herbicide residues or for toxicity studies of soil or aquatic pollutants.

75-2533. Sherma, J.; Touchstone, J. C. (Dep. Obstet. Gynecol., Harrison Dep. Surg. Res., Univ. Pennsylvania Med. Sch., Philadelphia, PA 19104). **Quantitative thin-layer chromatography of chloramben herbicide using densitometry.** *Chromatographia* 8(6): 261-264; 1975. (12 references)

The quantitative determination of chloramben herbicide by in situ densitometry of thin-layer chromatographs is described. Technical grade chloramben was analyzed by scanning of fluorescence after spraying with fluorescamine reagent. Chloramben residues may be determined, after diazotization and coupling of the amino group, by scanning the resultant red spots. Both methods involve saponification of the sample with NaOH to hydrolyze chloramben plant conjugates, followed by extrac-

tion and liquid-liquid partition. The herbicide was easily extractable into ether or benzene at a pH of ca. 2-2.5 or lower but remains in the aqueous phase at pH values of 5-6 or higher. Duplicate experiments with the modified methods gave recoveries of 70 and 80% for tomatoes and 90 and 75% for beans, both at 0.1 ppm levels of fortification, and an adequately clean background in the area of the pesticide spot. An external standard spot was included on each sample chromatogram to correct results back to the original calibration curve.

75-2534. Reichling, J.; Fischer, H. (Inst. Pharm. Biol., Univ. Heidelberg, Heidelberg, Germany). **Chromatographie von Carbamat- und Phenylharnstoff-Pesticiden auf Duennschichten von basischem Zinkcarbonat. [Chromatography of carbamate and phenylurea pesticides on thin layers of basic zinc carbonate.]** *Fresenius' Z. Anal. Chem.* 275(3): 201-202; 1975. (10 references) (German)

Thin layers of basic zinc carbonate can be used with good results for separation and multiple identification of carbamate and phenylurea pesticides. Five important substances could be separated by one-dimensional TLC. The best results were obtained with the following developing solvents: a) benzene, b) a mixture of benzene/petroleum ether/chloroform (6:1:1). The substances are either recognizable in short-wave UV-light, when a fluorescence indicator (F 254 nm) is added, or in daylight, after spraying a solution of 0.1 N $AgNO_3$ in 3 N HNO_3, followed by an UV-exposure for about 4 min. (Author abstract by permission)

75-2535. Kiigemagi, U.; Burnard, R. J.; Terriere, L. C.* (Dep. Agric. Chem., Oregon State Univ., Corvallis, OR 97331). **Analytical methods for detection of the piscicide 1,1'-methylenedi - 2-naphthol (Squoxin) in fish and water.** *J. Agric. Food Chem.* 23(4): 717-720; 1975. (10 references)

Procedures are given for the measurement of the piscicide 1,1'-methylenedi - 2-naphthol (Squoxin) in fish tissue, using gas chromatography, and in water, using a colorimetric method. For the GC method, Squoxin is converted to its dimethyl ether and detected by electron capture. The method is sensitive to 0.1 ppm of Squoxin in fish tissue. The second method, which is designed for use in the field, involves coupling the piscicide with the chromogenic agent, tetrazotized *o*-dianisidine (Diazo Blue B). With the use of extraction and concentration steps this method is sensitive to 2 ppb of Squoxin in water. The two methods have been used in the analysis of fish and water samples from field tests of Squoxin. (Author abstract reprinted by permission of the American Chemical Society)

75-2536. Wright, F. C. (U.S. Livestock Insects Lab., ARS, USDA, Kerrville, TX 78028). **Method to determine ronnel and its oxygen analog in eggs.** *J. Agric. Food Chem.* 23(4): 820-821; 1975. (2 references)

A simple method to determine ronnel (*O,O*-dimethyl *O*-(2,4,5 - trichlorophenyl) phosphorothioate) and its oxygen analog (dimethyl 2,4,5-trichlorophenyl phosphate) in chicken eggs is presented. With this method, lower limits of detectability of ronnel and its oxygen analog were found to be 0.5 and 2.0 ppb, respectively. Recoveries of the compounds from eggs fortified at 1-80 ppb were in the range of 70-75%. (Author abstract reprinted by permission of the American Chemical Society)

75-2537. Dupuy, A. E., Jr.; Forehand, T. J.; Tai, H. (Pestic. Monit. Lab., Tech. Serv. Div., Office Pestic. Programs, Bay St. Louis, MS 39520). **Determination of 2,4-dichlorophenoxyacetic acid in wheat grain.** *J. Agric. Food Chem.* 23(4): 827-828; 1975. (5 references)

A method for determining 2,4-dichlorophenoxyacetic acid (2,4-D) in wheat grain, with a sensitivity of 0.05 ppm, involves continuous liquid-liquid extraction of the acidified wheat grain with diethyl ether, followed by esterification of the 2,4-D with BCl_3 in 2-chloroethanol and gas chromatography of the ester. Interfering substances are removed by a Florisil column cleanup. Average recoveries of 89% are obtained from wheat grain to which known amounts of 2,4-D have been added. (Author abstract reprinted by permission of the American Chemical Society)

75-2539. Balinova, A. (Plant Protect. Inst., Kostinbrod, Bulgaria). **Thin-layer chromatographic detection of some systemic fungicides and their metabolites.** *J. Chromatogr.* 111(1): 197-199; 1975. (4 references)

A starch-iodide spray reagent with good sensitivity has been discovered for the thin-layer chromatographic (TLC) detection of benomyl and two of its metbolites (methyl 2-benzimidazolyl-carbamate (MBC) and 2-aminobenzimidazole (2-AB)) produced by hydrolysis in plants. This reagent can also be used to detect the systemic fungicides ethirimol and dimethirimol. Three solvent systems were established, each of which permits good separation of these compounds: chloroform-ethyl acetate-methanol (3:2:1); chloroform - acetone - acetic acid (5:2:0.5); and benzene-acetic acid (5:1). The use of these solvent systems with the one-dimensional TLC technique provided good separation of the five fungicides, which appeared as intense blue spots on a white background. The results could be satisfactorily interpreted after 1-2 days and were not affected by the type of adsorbent applied.

75-2539. Berck, B. (Canada Agr. Res. Branch, Winnipeg, Canada). **Analysis of fumigants and fumigant residues.** *J. Chromatogr. Sci.* 13(6): 256-267; 1975. (196 references)

This article is an overview and status summary of analytical methods for fumigants and fumigant residues. A fumigant is defined as a gaseous pesticide. Fumigant residue is that amount of original or unchanged gas or vapor (parent molecule), or degradation product, metabolites,

adduct, or conjugate thereof (offspring molecule) that remains on or in a substrate (animal, plant, or mineral product) after application of a fumigant. Residues can be both physically bound and chemically bound. Physically bound residues are reversible and thus temporary. Chemically bound residues are irreversible and thus permanent. Analytical methods for the following specific fumigants and their residues are discussed: acrylonitrile, carbon dioxide, carbon disulfide, carbon tetrachloride, chloroform, chloropicrin, dichloropropane dichloropropene mixture, 2,2-dichlorovinyl dimethyl phosphate, ethylene dibromide, ethylene dichloride, ethylene oxide, hydrogen cyanide, methyl bromide, phosphine, propylene oxide, sulfur dioxide, and trichloroethylene. Methods to extend fumigant research include combinations of gas chromatography, ion-selective electrodes, and new developments in spectrometry and polarography.

75-2540. Moye, H. A. (Pestic. Res. Lab., Food Sci. Dep., Univ. Florida, Gainesville, FL 32611). **Plasma chromatography of pesticides.** *J. Chromatogr. Sci.* 13(6): 285-290; 1975. (10 references)

Ion mobility (plasma chromatographic) spectra for 23 pesticides and/or metabolites, predictions on limits of detection, an analytical curve, and an application to the analysis of liquid chromatographic fractions, and several other observed phenomena are presented. Formation of ions (both positive and negative) from the pesticides (and metabolites) is accomplished within the reaction region of the plasma chromatograph cell by ion-molecule reactions. If care is taken to ensure that minimum amounts of low volatiles are administered (1 μg or less), this instrument could prove valuable as a detector for liquid or gas chromatography of fairly clean crude extracts.

75-2541. McLeod, H. A. (Food Res. Div., Health Protection Branch, Health Welfare, Ottawa, Canada). **Systems for automated multiple pesticide residue analysis.** *J. Chromatogr. Sci.* 13(7): 302-307; 1975. (43 references)

This article reviews the status of automated systems for analyzing pesticides in commercial formulations and their residues in food and environmental samples. The number and type of sample and the pesticide being measured determine whether automation is practical. Automation becomes more difficult when it is necessary to screen a variety of samples for many different pesticides, industrial contaminants and their metabolites. However, certain steps in multiresidue methods can be and have been integrated into semi-automated procedures. Various configurations of equipment that perform specific steps in a method of analysis are described in this article. These include the use of Technicon modules, automatic injectors for gas chromatography, specially designed units and data processing systems.

75-2542. Bowman, M. C. (Dep. Health Education Welfare, FDA, Natl. Cent. Toxicol. Res., Jefferson, AR 72079). **Analysis of insect chemosterilants.** *J. Chromatogr. Sci.* 13(7): 307-313; 1975. (31 references)

Chemicals have effectively been used to sterilize some insect species which are not sterilized by irradiation. The most effective insect chemosterilants are generally alkylating agents derived from ethylenimine (aziridine). However, some dialkylamine analogs of the ethylenimine sterilants have also shown promise. The safe and efficient use of chemosterilants requires information concerning purity, stability, uptake, metabolism, and persistence. Residues of these mutagenic compounds in sterile insects slated from release into the environment are of particular importance since they could adversely affect predatory animals. Analytical methods for determining trace levels of 19 P- and/or S-containing chemicals of current interest are presented in this article. GC retention times of the compounds on 6 different columns and their p-values in 11 solvent systems are tabulated. The utility of the flame photometric detector for determining subnanogram levels of the sterilants in biological substrates is illustrated. The exceptional specificity of the flame photometric detector permits the analysis of biological samples with little or no cleanup.

75-2543. Beroza, M. (Organ. Chem. Synthesis Lab., Agric. Environ. Quality Inst., Beltsville, MD 20705). **Microanalytical methodology relating to the identification of insect sex pheromones and related behavior-control chemicals.** *J. Chromatogr. Sci.* 13(7): 314-321; 1975. (34 references)

Many insects communicate with others of their species by means of odor chemicals called pheromones; these chemicals can be most useful in pest control, especially in insect detection. The minute amount of active component available in insects causes problems because large numbers of insects are normally required to obtain enough material for identification. The development of microanalytical methodology, particularly that associated with new and sophisticated electronic instrumentation, has greatly advanced the field. Methods currently in use for the extraction, isolation, and identification of insect sex attractants are described briefly. This same methodology has been employed to decipher the structure of other behavior controlling odor chemicals, and there is little doubt that this methodology can be applied similarly to identify minute amounts of other biologically active compounds. It is suggested that two powerful analytical techniques, X-ray crystallography and carbon-13 NMR, will play increasingly important roles in microanalysis as the size of the sample required is reduced to the low microgram level.

75-2544. Vander Velde, G.; Ryan, J. F. (Finnigan Corp., Sunnyvale, CA 94086). **Gas chromatography-mass spectrometry as applied to pesticide analysis.** *J. Chromatogr. Sci.* 13(7): 322-329; 1975. (25 references)

The use of gas chromatography/mass spectrometry

(GC/MS) by the pesticide chemist has added considerably to his ability to identify pesticide contaminants in a wide variety of samples. The utilization of several complementary GC/MS techniques has enabled him to make rapid positive identification. Ancillary techniques enable him to perform very specific quantitative analyses. Newer mass spectrometry techniques show promise of furthering this analytical capability and improving sensitivity and specificity in the future. This paper is designed to point out the variety of GC/MS applications in pesticide chemistry with particular emphasis in the following areas: identification of unknowns, specific low level quantitation, and quality control in the pesticide laboratory.

75-2545. Aue, W. A. (Dep. Chem., Trace Analysis Res. Cent., Dalhousie Univ., Halifax, Nova Scotia, Canada). **Detectors for use in GC analysis of pesticides.** *J. Chromatogr. Sci.* 13(7): 329-333; 1975. (59 references)

The correct choice and proper operation of a gas chromatographic detector are prerequisites in many types of pesticide residue analysis. This paper attempts to characterize briefly the detectors important for the gas chromatographic analysis of pesticides, to note any significant improvement or better understanding of their function that has come up in the past few years, and to present a brief view of some ancillary techniques and less commonly used detection systems. Often in pesticide analysis either of 2 detectors can be profitably employed, thus encouraging comparison and preference expression. Detectors discussed in this paper include the flame ionization detector; the electron capture detector; the alkali flame ionization detector; the flame photometric detector; and the electrolytic conductivity detector. In general, the analysis of chlorinated hydrocarbons and other strongly electron capturing substances is still the undisputed domain of the electron capture detector. Analysis of thiophosphates and related compounds is a toss-up. The alkali flame ionization detector is about two orders of magnitude more sensitive than the flame photometric detector, and it is also less expensive. Generally, for thiophosphates, the eletron capture detector is considered a poor choice in view of its inadequate discrimination against many (polar) co-extractants, and the consequent increased demand on prior sample cleanup. The analysis of nitrogen compounds is still a toss-up between the electrolytic conductivity detector and the currently most promising representative of the alkali flame ionization detectors.

75-2546. Zigic, M.; Starovic, N. (Plant Protection Institute, Belgrade, Yugoslavia.) **Primena gasnohromatografske metode za odredivanje ostataka insekticida—hlorovanih ugljovodonika u duvanu.** [**Use of gas chromatography to detect residues of chlorinated hydrocarbon insecticides in tobacco.**] *Kem. Ind.* 22(1): 17-19; 1973. (11 references) (Serbo-Croatian)

The purity of an extract of dried tobacco was tested over a chromatography column filled with florisil and containing 1% moisture, for the purpose of detecting by gas chromatography the presence of chlorinated pesticide, using an electron capture detector. When florisil chromatography was employed, the tobacco became colorless, but chromatography gave peaks for all the additional active principles contributed by the chlorinated insecticides. It was concluded from the test data that in the process of purifying the tobacco extract it was possible to detect residues of lindane, heptachlor, aldrin, chlordane, dieldrin, and DDT in tobacco.

75-2547. Engst, R.; Schnaak, W. (Zentralinst. Ernaehrung, Bereich Fremdstoffe in Nahrung und Ernaehrung, DDR-1505 Bergholz-Rehbruecke, DDR). **Papier-chromatographische und polarographische Bestimmung von Aethylenthioharnstoff Rueckstaendenden in Lebensmitteln.** [**Paper chromatographic - polarographic determination of ethylene thiourea residues in foods.**] *Nahrung* 18(6/7): 597-602; 1974. (16 references) (German)

A combined paper chromatographic - polarographic method for determining ethylene thiourea residues in vegetables and animal foods is presented. Quantitative evaluation is made by visual spot comparison or by the more accurate impulse polarographic determination of the eluate and nitrosated substance. This method allows quantitative determination of concentrations as low as 0.05-0.2 ppm, depending on the substance investigated. A mean recovery rate of 70% is obtained with this method. Potatoes, tomatoes, meat, and liver were tested.

75-2548. Ackermann, H.; Ingr, I.; Engst, R. (Zentralinst. Ernaehrung, Bereich Fremdstoffe in Nahrung und Ernaehrung, DDR-1505 Berholz-Rehbruecke, DDR). **Untersuchungen zum enzymatischen Nachweis von Dimethoat. Einfluss verschiedener Aktivierungsverfahren auf die Nachweisempfindlichkeit.** [**Studies on the enzymatic detection of dimethoate. The effects of various activation procedures on detection sensitivity.**] *Nahrung* 18(8): 813-825; 1974. (27 references) (German)

The behavioral response of dimethoate to various oxidation procedures and the effects on the formation of the biologically active PO-derivative were studied. After separation by thin-layer chromatography, biologically active compounds are identified enzymatically. The original substances and a series of metabolites are chemically detected using 2,6-dichloroquinone chlorimide. Only one oxidation procedure tested (that using potassium permanganate in sulfuric acid solution) leads to optimal formation of PO-derivative. Oxidation of extracts by potassium permanganate means an additional purification which enhances the sensitivity of both enzymatic and chemical detection.

75-2549. Tomiya, Y.; Inoue, S.; Kanda, M. (Sch. Forensic Med., Fac. Med., Kumamoto Univ., Kumamoto, Ja-

pan). [**The extraction of toxic substances from organs of organofluorine pesticide-intoxicated carcasses and the effects of putrefaction on recovery.**] *Nippon Hoigaku Zasshi (Jpn. J. Leg. Med.)* 28(6): 461; 1975. (Japanese)

Ten times the LD50 amount of sodium monofluoroacetate (as 1% aqueous solution) was administered p.o. to rabbits to kill them by acute intoxication. Organs were extracted with ether, acetone, *n*-hexane, and a mixture of ether and petroleum ether; the extracted organofluorines were determined by colorimetry with alizarine. Generally, on all organs, ether was excellent for extraction, however, on the liver *n*-hexane was superior. By using any solvent, the recovered amount of organofluorine from the content of the stomach was 30-40% of total amount recovered. The amount of sodium monofluoroacetate recovered from brain per unit weight of tissue was about 2 times that from other organs per unit weight. The recovered amount of organofluorine was about the same 24 hr after death as just after death, and decreased gradually, by 10-20% after 3 days and by 50-80% after the carcass was kept at 21-25°C in a room.

75-2550. Muto, H.; Shimoda, R.; Obo, S. (Sch. Forensic Med., Fac. Med., Kumamoto Univ., Kumamoto, Japan). [**Bodily distribution and excretion of organofluorine in organofluorine pesticide-intoxicated carcasses incorporating the zirconium-alizarine method of determination.**] *Nippon Hoigaku Zasshi (Jpn. J. Leg. Med.)* 28(6): 461; 1975. (Japanese)

One fourth to 1/64 LD50 doses of sodium monofluoroacetate were administered p.o. 30-53 times to rabbits (b.w. 3 kg). Urine and feces were collected twice weekly. Rabbits were killed one, three, and six months after the final administration, and sodium monofluoroacetate was determined in organs. The poison detected in the liver, kidney, brain, heart, and intestines was 43.8, 6.1, 6.1, 3.9, and 33.2% respectively of the total amount of 1/4 LD50 dose administered; total recovery was 93.4%. The method used was zirconium-alizarine. When single doses were smaller than 1/8 LD50, the percentage recovered increased. These high recovery percentages were thought to be due to a determination error of the zirconium-alizarine method, especially in the range below the detection limit of the method. It was demonstrated to be necessary to remove interfering ions unless the amount administered is large.

75-2551. Takahama, K.; Waseda, Y. (Sch. Forensic Med., Fac. Med., Kumamoto Univ., Kumamoto, Japan). [**Detection of organophosphorus and carbamate pesticides by the enzymatic inhibition method on TLC.**] *Nippon Hoigaku Zasshi (Jpn. J. Leg. Med.)* 28(6): 463; 1975. (Japanese)

The detection of 11 organophosphorus pesticides and 5 carbamate pesticides was studied by the enzyme inhibition method through thin-layer chromatography. Rat liver homogenate showed highest sensitivity as an enzyme source, followed by homogenates of rat brain, spleen, and kidney. Indoxylacetate was used as substrate. The liver homogenate could be kept sufficiently active by freezing. A developing solvent of 20% dimethyl formamide in acetone as the stationary phase and iso-octane as the mobile phase are very good in terms of their suitability for both organophosphorus and carbamate pesticides. It is necessary to spot about 5 μg of the active ingredient on the plate. Some examples were given.

75-2552. Lincer, J. L. (Cornell Univ., Sect. Ecol. Systematics, Ithaca, NY). **Polychlorinated biphenyls: their potential interference with pesticide residue analysis and present analytical status.** *Progr. Anal. Chem.* 5: 109-131; 1973. (56 references)

In the 1960's, colorimetric methods of chemical analysis ceased to provide the kind of qualitative and quantitative data required by the pesticide analytical chemist. A new phase of pesticide analysis began. Because of the possibility of interferences from a variety of compounds including non-pesticide electron-capturing polynuclear hydrocarbons and "hybrid" residues, confirmation of PCB identification has been a necessity. Work in 1971 indicated that carbon-skeleton chromatography may be useful for qualitative differentiation between PCBs and DDT or TDE. Interference must also be expected from PCBs in the determination of pesticide residue levels. A few studies to date have resulted in an estimation of the potential error associated with ignoring the presence of PCBs. The relative interference must, of course, be checked for the particular operating conditions used and/or sample group being analyzed. The present analytical status in the areas of separation and quantitation is discussed. By using standard extraction and clean-up procedures appropriate for organochlorine pesticides followed by close examination of resulting chromatograms, one can decide whether or not PCB separation is required. Very adequate separations are available to the analytical chemist to separate PCBs from pesticide residues. However, there is as yet no one standard technique for quantitation.

75-2553. Goodson, L. H.; Jacobs, W. B. (Life Sci. Div., Midwest Res. Inst., Kansas City, MO). **Rapid detection system for organophosphates and carbamate insecticides in water.** *Environ. Prot. Technol. Ser.* EPA-R2-72-010, 1974, 66p. (11 references)

An apparatus for the detection and monitoring of water supplies for hazardous spills of organophosphate and carbamate insecticides has been designed and fabricated. The new unit is called the Cholinesterase Antagonist Monitor, CAM-1, because it produces an alarm in 3 min when toxic or subtoxic levels of cholinesterase antagonists are present in water. Response of this apparatus to subtoxic levels of azodrin (monocrotophos), sevin (carbaryl), dimetilan, malathion, parathion, and DDVP (dichlorvos) has already been demonstrated. CAM-1 uses

immobilized cholinesterase for the collection of cholinesterase inhibitors from the water supplies. The activity of the immobilized cholinesterase is determined automatically in an electrochemical cell by passing a substrate solution over the enzyme at regular time periods. A minicomputer is used to automate the detection process and to signal an alarm when there is a rapid loss of enzyme activity - a situation which occurs in the presence of organophosphate and carbamate insecticides in the water sampled.

75-2554. Asaka, S.; Kawachi, N.; Seguchi, K.; Izawa, T.; Sekiguchi, M. (Nippon Kayaku Co., Ltd., Japan). [**Determination of propaphos and its two metabolites as pesticide residues.**] *Noyaku Kagaku (J. Pestic. Sci.)* 3(1): 36-42; 1975. (11 references) (Japanese)

Residues of *O,O*-dipropyl *O*-(4-methylthiophenyl) phosphate (propaphos), and its two oxidative metabolites, the sulfoxide and the sulfone, were determined in brown rice, rice straw, and soil by extracting with methanol and separating by gas chromatography. The recovery of parent compound and metabolites ranged from 88 to 103%. If large amounts of interfering materials were present, other methods of reduction (reducing the sulfoxide to the sulfide with acetyl chloride) and of oxidation (oxidizing to the sulfone) were established. With the former method, the recovery from sulfoxide to sulfone was 84-91%, and with the latter method, the recovery from the mixture of propaphos and sulfoxide to sulfone was 98-103%.

75-2555. Agricultural Chemicals Inspection Station. (Ministry Agric. Forestry, Kodaira, Tokyo, Japan). [**Official methods of inspecting agricultural chemicals. Part 29. EDDP EC, MTMC EC, and DEP powder.**] *Noyaku Kagaku (J. Pestic. Sci.)* 3(1): 43-45; 1975. (Japanese)

Officially notified methods with No. 883 on Sept. 20, 1974; EDDP (*O*-ethyl *S,S*-diphenyl dithiophosphate) EC: chloroform solution of the EC was spotted on a silica gel plate and developed upward with a mixture of benzene and methyl ethyl ketone (5:1), then illuminated by UV and the dark purple part was extracted with methanol. After evaporating the methanol, the residue was oxidized with sulfuric and nitric acid. After dissolving the residue in water and adding molybdate reagent, its extinction was determined at 420 nm. The content was determined by comparing the calibration curve prepared with the authentic compound. MTMC (*m*-tolyl *N*-methylcarbamate) EC: an acetone solution of the EC was spotted on silica plate, developed by hexane-ethyl acetate (7:3) upwards. The parts of dark violet in color under UV was dissolved in methanol and decomposed by potash. Adding the color agent (*p*-nitrobenzenediazonium fluoroborate in methanol), the extinction at 500 nm was determined. The value was calculated by comparing the calibration curve made of the authentic compound. DEP (trichlorfon) powder was extracted with methanol. The methanolic solution was analyzed by the method already reported for DEP EC.

75-2556. Takeda, A. (Natl. Inst. Hyg. Sci., Minist. Welfare, Tokyo, Japan). [**Methods of pesticide residues determination according to the standard of foods and food additives. Part 3. A carbamate, carbaryl.**] *Noyaku Kagaku (J. Pestic. Sci.)* 3(1): 46-49; 1975. (3 references) (Japanese)

Homogenized specimen was extracted by dichloromethane; after evaporating the solvent the residue was dissolved in a small amount of *n*-hexane. After column chromatography with Florisil plus anhydrous sodium sulfate with *n*-hexane, elution was carried out by a mixture of *n*-hexane and dichloromethane (50%). The second elute was washed with a mixture of sodium hydroxide and chloride condensed and dissolved in acetone. The acetonic solution was column-chromatographed on Dalco G 60 Avicel (1:10) and anhydrous sodium sulfate with acetone. After evaporating acetone and dissolving the residue in methanol, the methanolic solution was decomposed by sodium hydroxide in methanol and then after adding acetic acid and the coloring agent (*p*-nitrobenzene diazonium fluoroborate in methanol) its extinction at 475 nm was determined, the content of carbaryl being calculated by the calibration curve obtained by the authentic compound.

75-2557. Smodlaka, N. (Cent. Marine Res., Ruder Boskovic Inst., Rovinj, Yugoslavia). **Unidentified compounds in seawater chromatographically similar to PCBs.** *Marine Pollut. Bull.* 5(6): 84-86; 1974. (10 references)

Chlorinated hydrocarbons were extracted from seawater samples and analyzed by gas chromatography and mass spectrometry. In a typical chromatogram, five peaks were obtained. The last peak corresponded to 2,4,5,2',5'-pentachlorobiphenyl, and while the four earlier peaks would normally be assumed to be PCBs based on their column retention times, their partition coefficients indicated that none should be so identified. These four earlier peaks were acid-stable and were not sulfur peaks or organophosphates. All four compounds were probably chlorinated hydrocarbons and it is likely that one of the compounds resulted from the oxidation of one of the others. The results indicate that care must be taken in the interpretation of gas chromatographic analyses of chlorinated hydrocarbons.

75-2558. Gonnet, C.; Rocca, J. L. (Equipe Res. Assoc., C.N.R.S., Lab. Chim. Anal. III. Univ. Lyon, Villeurbaine, France). **Separation d'herbicides par chromatographie en phase liquide a haute performance. Influence de l'eau.** [**Separation of herbicides by high-performance liquid chromatography. Influence of water.**] *J. Chromatogr.* 109(2): 297-303; 1975. (10 references) (French)

Chromatographic conditions for analysis of herbicides by high-performance liquid chromatography were examined. In all cases, a rapid preliminary analysis of the system was made using thin-layer chromatography. Column passage was then performed in order to optimize the eluting power of the solvent or other parameters if necessary. The column conditions included: column, 14.5 cm x

4.6 mm; support, Lichrosorb Si 60, 5 μm; injection, 10 μl; flow rate, 6 mm/min; pressure, 65 bar; detection, UV LDC, 254 nm; mobile phase, dichloromethane saturated with water; or: column, 25 cm x 4.6 mm; support, injection and flow rate as above; pressure, 100 bar; detection, UV Zeiss 254 nm; mobile phase, dichloromethane/2-propanol (98.5:1.5). These systems, especially the system using dichloromethane modified with water, were highly selective in separating substituted thermolabile urea herbicides. Microporous supports were optimal.

75-2559. Nesemann, E.; Seehofer, F. (Dep. Res. Development, B-A-T Cigaretten-Fabrik GmbH, Hamburg, Germany). **Methods for the quantitative determination of biocides in tobacco and tobacco products. Part VI: a modified procedure for organochlorine, organophosphorus and carbamate insecticide residues in tobacco.** *Beitrage Tabakforsch.* 7(5): 251-262; 1974. (8 references)

A 1970 screening procedure for the determination of pesticide residues in tobacco has been improved by the introduction of dry-column chromatography as a cleanup procedure. this procedure involves filling an empty column with adsorbent, depositing the pesticide mixture at the top of the column, and developing the chromatogram by allowing the acetonitrile solvent to move down the dry column by capillary action and gravity. Phosphated pesticides and metabolites can then be analyzed by flame photometric gas chromatography, and chlorinated compounds can be screened by microcoulometric gas chromatography. More detailed analysis can be achieved after separation on a micro-Florisil column, and the presence of PCB, PCN requires subsequent separation on a silica gel column. With the carbamate insecticides, cleanup via distillation of the purified, hydrolyzed tobacco extract is required for efficient detection. The method described can be applied to the extraction and cleanup of various insecticides, fungicides, herbicides, and metabolites. Recoveries vary between 72 and 102% after the addition of pesticides at the 0.5 ppm level. The coefficient of variation with parathion was 4.4%.

See also **75-2398** **75-2500**

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